WORKING COPY
FOURTH FIVE-YEAR REVIEW REPORT
FORMER WILLIAMS AIR FORCE BASE
MESA, ARIZONA

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LIST OF ACRONYMS AND ABBREVIATIONS

10^{-4}	one in ten thousand
10^{-5}	one in one hundred thousand
10^{-6}	one in one million
BPW6	Base Production Well Number 6
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
CSM	conceptual site model
DCD	demonstration conceptual design
DERP	Defense Environmental Restoration Program
DEUR	Declaration of Environmental Use Restriction
DoD	U.S. Department of Defense
DoDM	Department of Defense Manual
DPE	dual-phase extraction
E/A	evaluation/assessment
EBR	enhanced bioremediation
EBS	Environmental Baseline Survey
EC	engineering control
EPA	U.S. Environmental Protection Agency
ESD	explanation of significant difference
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
ft	foot, feet
GPL	groundwater protection limit
gpm	gallons per minute
GRIC	Gila River Indian Community
HBGL	health-based guidance level
HI	Hazard Index
IC	Institutional Control
ICE	internal combustion engine
ILCR	Incremental Lifetime Cancer Risk
IRP	Installation Restoration Program
IT	IT Corporation
IWAS	in-well air stripping
JP-4	jet propulsion fuel grade 4
lbs	pounds
LNAPL	light non-aqueous phase liquid
MCL	maximum contaminant level
mg/kg	milligrams per kilogram

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
No.	Number
NPL	National Priorities List
O&M	operations and maintenance
OM&M	operations, maintenance, and monitoring
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
Parsons	Parsons Engineering Science, Inc.
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PDI	Pre-Design Investigation
PMGAA	Phoenix-Mesa Gateway Airport Authority
PRG	preliminary remediation goal
PS/DS	pilot study/demonstration study
RA	remedial action
RAB	Restoration Advisory Board
RACR	Removal Action Completion Report
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RG	remediation goal
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act
SEE	Steam Enhanced Extraction
SRA	Supplemental Risk Assessment
SRL	soil remediation level
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TBC	to be considered
TCE	trichloroethene
TEE	thermal enhanced extraction
TMB	trimethylbenzene
TPH	total petroleum hydrocarbons
TTF	Temporary Treatment Facility
TVH	total volatile hydrocarbons
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
UST	underground storage tank
UU/UE	unlimited use/unrestricted exposure
UXO	unexploded ordnance

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

VEMUR	Voluntary Environmental Mitigation Use Restriction
VOC	volatile organic compound
WGAA	Williams Gateway Airport Authority
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

The Air Force (AF) has conducted a fourth five-year review at the former Williams Air Force Base (AFB), Mesa, Maricopa County, Arizona. This review was conducted from December 2015 to April 2016 by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), under contract to the Air Force Civil Engineer Center (AFCEC). The first five-year review addressed the period of June 1996 to June 2001. In 2006, a five-year review that was developed, but not finalized or signed, is considered the second five-year review and addressed the period of June 2001 to June 2006. The third five-year review addressed the period of June 2006 to June 2011.

The review covers the status of selected remedies to protect human health and the environment that have been chosen for individual sites in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan. Sites considered in this review either have completed removal or remedial actions (RAs) that left hazardous substances, pollutants, or contaminants on-site at levels that preclude unlimited use and unrestricted exposure (UU/UE), or the RA is intended to achieve levels that allow for UU/UE but the action requires five or more years to complete. The issues and recommendations identified in the First Five-Year Review (IT Corporation [IT], 2001), the *Pre-Concurrence Copy Second Five-Year Review Report, 2001-2006* (Mitretek Systems [Mitretek], 2006) and Third Five-Year Review (URS Corporation [URS], 2012a) were considered in this Five-Year Review. This report, organized in accordance with the most current five-year review guidance published by the U.S. Environmental Protection Agency (EPA) (EPA, 2001), documents the results of the review.

Selected remedies and Records of Decision (RODs) for individual sites at the former Williams AFB are organized into Operable Units (OUs) 1 through 6. Summaries of the technical assessment, remedy protectiveness, issues, and recommendations for each OU are provided below.

OU-1

The only OU-1 site requiring five-year review is LF004. The OU-1 ROD (Air Force Base Conversion Agency [AFBCA], 1994) identified No Further Action (NFA) as the selected remedy for the other nine OU-1 sites. The sewage sludge trenches (DP028) were added to the LF004 remedy by Explanation of Significant Difference (AF, 1995). The soil remedy at LF004, including DP028, is expected to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. The permeable cap is effective at breaking the exposure pathway to surface soil contaminants and engineering controls are in place and effective. Operation and maintenance (O&M) at LF004 has effectively prevented future exposure to contaminated soil by maintaining the cap as intended by the ROD.

Post-closure groundwater monitoring at LF004 has consistently detected volatile organic compounds (VOCs) (tetrachloroethene [PCE] and trichloroethene [TCE]) at concentrations above the Aquifer Water Quality Standard/Maximum Contaminant Level. Based on the findings of the Supplemental Remedial Investigation (URS, 2010), a Focused Feasibility Study (FFS)

(AMEC Environment & Infrastructure, Inc. [AMEC], 2013a) was completed to evaluate remedial alternatives for soil gas and groundwater impacts at LF004.

The OU-1 ROD Amendment was prepared to document a change in the LF004 remedy in order to address TCE and PCE in soil gas and groundwater (AMEC, 2014a) by implementing in-well air stripping, oxidation, and soil vapor extraction (SVE). O&M and monitoring of LF004 groundwater and soil gas treatment systems began on 29 August 2014 and continues to date.

No deficiencies in the remedies for the sites in OU-1 were discovered during the five-year review.

The remedy at OU-1 is protective of human health and the environment. Implementation of the selected remedy is achieving the primary remediation goal (RG) established in the OU-1 ROD of overall protection of human health and the environment by providing a barrier between the contaminated soil and any potential human or environmental receptors. The selected remedy for soil gas and groundwater, specified by the OU-1 ROD Amendment, is currently being implemented to achieve the established remedial action objectives (RAOs) in calendar year 2020.

OU-2

OU-2 was established for ST012, the Liquid Fuels Storage Area. The OU-2 ROD (IT, 1992a) selected SVE for shallow soil (less than25 feet [ft] below ground surface [bgs]) and a pump-and-treat remedy for groundwater to address contamination with fuels and VOCs including benzene. SVE for shallow soil was completed in 1996; however, a ROD Amendment (IT, 1996a) was completed in 1995 adding SVE for deep soil (greater than 25 ft bgs) which is still ongoing. The OU-2 remedy for groundwater defined in the OU-2 ROD (IT, 1992a) was subsequently replaced by the OU-2 ROD Amendment 2 (AMEC, 2013b) selected remedy following numerous RA and treatability studies. The OU-2 ROD Amendment 2 remedy for groundwater at ST012 is steam enhanced extraction (SEE) and enhanced bioremediation (EBR). The active components (SEE and EBR) of the selected remedy for groundwater will be implemented until the chemical-specific cleanup levels are reached, or analysis of biological and natural attenuation related degradation suggest that contaminants will naturally degrade to the desired concentration within an overall remedial timeframe of approximately 20 years from execution of the OU-2 ROD Amendment 2. Full scale O&M and monitoring of the SEE system began 29 September 2014 and continues to date.

For the shallow and deep soil remedies, current promulgated Arizona cleanup standards are more stringent than those RGs established in the ROD and ROD Amendment – both of which are based on residential land use. The AF has implemented a Declaration of Environmental Use Restriction (DEUR) to prevent residential use to maintain protectiveness of the implemented remedy.

The remedy at OU-2 currently protects human health and the environment because a DEUR, implementing institutional controls (ICs) for ST012, was recorded in June 2008 and the current remedy for deep soil and groundwater has been implemented. However, in order for the remedy to be protective in the long-term, a soil-specific FFS is needed to determine appropriate long term remedy for shallow and deep soil based on current standards. Subsequently, decision documents and remedy implementation may be required to ensure protectiveness.

OU-3

OU-3 was established for FT002, a Fire Training Area, and the Southwest Drainage System (SD009), with the selected remedy for the latter site being NFA. The selected remedy for FT002 was bioventing to address benzene, chloroform and 1,4-dichlorobenzene in soil. Implementation of the selected remedy, including SVE enhancements, did not achieve the cleanup levels established in the ROD (IT, 1996b). Accordingly, in 2008, the AF implemented deed restrictions, in the form of a DEUR, which prohibit residential use and requires appropriate soil management procedures for excavations greater than 5 ft bgs.

Subsequent to placement of the DEUR, SVE was implemented to elevated level of address VOCs in soil and soil gas. The elevated levels of VOCs were present in the subsurface soils at levels which prevented site closure with unrestricted uses (AMEC, 2014b). SVE operations were conducted from 02 June 2014 to 15 June 2015. A field variance specified excavation and removal of the residual trimethylbenzene from the surface soil, which was conducted in late 2015 and early 2016.

The remedy at OU-3 currently protects human health and the environment because a DEUR, implementing ICs for FT002, was recorded in April 2008. However, in order for the remedy to be protective in the long-term, issuance and acceptance of a closure report documenting RAOs have been achieved is required for removal of the DEUR and of unrestricted use as specified in the OU-3 ROD.

OU-4

Of the 10 sites included in the OU-4 ROD (IT, 2000a), the selected remedy for five of the sites was NFA and the selected remedy for the remaining five sites included ICs to address contaminants left on site. Sites with ICs in OU-4 are summarized as follows:

- *SS016 (Electroplating/Chemical Cleaning Shop, Building 1085).* The OU-4 ROD indicates that SS016 is acceptable for non-residential use but levels of arsenic and chromium exceed levels allowing for UU/UE. The SS016 property has been transferred to the Phoenix-Mesa Gateway Airport Authority. A deed restriction and DEUR have been implemented to prevent residential reuse. The remedy at SS016 is protective of human health and the environment.
- *SS019 (Former Skeet Range at South Desert Village).* The OU-4 ROD indicates that lead was present at SS019 above levels allowing for UU/UE. The OU-4 selected remedy for SS019 was excavation, disposal, and ICs. An excavation and disposal action, including backfilling with a soil cap, was completed in 1998. ICs include a Voluntary Environmental Mitigation Use Restriction (VEMUR), implemented in 1999, that requires maintenance of the soil cap and prohibits habitation by children under seven years of age. The remedy at SS019 is protective of human health and the environment.
- *SS020 (Firing Range/Skeet Range).* The OU-4 ROD indicates that lead was present at SS020 above levels allowing for UU/UE. The OU-4 selected remedy for SS020 was excavation, disposal, and ICs. An excavation and disposal action, including backfilling with a soil cap, was completed in 1998. ICs include deed restrictions, implemented upon

transfer in 2009, that prohibit residential use of the property. The DEUR for the Firing Range property was recorded in September 2008 and a DEUR for the Skeet Range area was recorded in October 2012. The remedy at SS020 is protective of human health and the environment.

- *SS021 (Facilities 1020/1051)*. The OU-4 ROD indicates that SS021 does not pose an unacceptable risk to human health and the environment. However, due to the presence of spent bullets on the ground surface, an IC remedy was selected. ICs include a DEUR, implemented in 2007, to prohibit residential use. The remedy at SS021 is protective of human health and the environment.
- *SS024 (Building 1010 - Entomology)*. The selected remedy for SS024 was ICs in the form of a deed restriction and VEMUR to limit the site to non-residential use due to the presence of pesticides in soil. The deed included transfer of SS024 without the use restriction (the deed includes an exclusion for SS024 but the legal description for the excluded area did not include the site area) and a VEMUR has not been recorded. The deed specifies that transfer of the property by the City of Mesa may not occur within a 30-year period from the conveyance date without the approval of the AF. Subsequently, a DEUR was recorded by the City of Mesa in April 2015. The remedy at SS024 is protective of human health and the environment.

OU-5

OU-5 includes nine sites, eight of which were identified for NFA in the OU-5 ROD (IT, 1997a). DP028 was incorporated under the LF004 landfill cap and is therefore addressed as part of LF004 (OU-1).

OU-6

OU-6 was established to address SS017, the Old Pesticide and Paint Shop (including the associated site Base Production Well 6 [BPW6]), the Investigative Waste Facility, and the Decontamination Pad at Facility 1069. For SS017, a Draft-Final ROD was developed (IT, 2000b), but not finalized. Nonetheless, the remedy specified in this ROD was implemented including a removal action in 2001 to remove soil impacted by dieldrin to a depth of 4 meters bgs. A similar action was implemented for Base Production Well Number 6 to address soil impacted by polychlorinated biphenyls. Groundwater monitoring at SS017 was initiated in 1998 and is ongoing. The AF continues to own and control the property. The removal action implemented at SS017 provided protection of human health and the environment by addressing exposure to surface soil.

A Draft OU-6 ROD (URS, 2012b) was issued selecting remedies proposed in the Draft Final Amended Proposed Plan (AFRPA, 2011). The Draft OU-6 ROD (URS, 2012b) was not finalized nor executed.

Subsequent to issuing the Draft Final Amended Proposed Plan (AFRPA, 2011), a Supplemental Risk Assessment (SRA) (AMEC, 2014b) was conducted to provide an updated risk characterization for Site SS017 to reflect chemical residuals subsequent to the removal action to evaluate if the potential for remaining residual dieldrin concentrations adversely impact groundwater, either in terms of groundwater quality or future risk. The SRA concluded that the

cumulative site risk to an individual based on reasonable maximum exposure for both current and future land use is less than one in one hundred thousand (10^{-5}), and the noncarcinogen hazard is less than one, and NFA is warranted. A Draft Final Amended Proposed Plan (AFRPA, 2015) was issued to the EPA and the Arizona Department of Environmental Quality (ADEQ) which proposed a selected remedy of NFA for SS017. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017 and do not agree that the residual risk posed by SS017 supports a finding that the site is ready for unrestricted use and unlimited exposure.

A protectiveness determination of the remedy at OU-6 cannot be made at this time until soil and groundwater remedies have been determined by finalization of a ROD. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017. The dispute resolution is expected to be finalized in May 2016. Subsequently, completion of an amended proposed plan and ROD it is expected to complete in 2017, at which time a protectiveness determination will be made.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Former Williams Air Force Base		
EPA ID: AZ 7570028582		
Region: 9	**State:** Arizona	**City/County:** Mesa/Maricopa
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): Under Construction ☒ Operating ☒ Complete		
Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** ___ / ___ / _____	
Has site been put into reuse? ☒ YES ☐ NO		
REVIEW STATUS		
Lead agency: ☐ EPA ☐ State ☐ Tribe ☒ Other: Federal Agency (Air Force)		
Author name: Catherine Jerrard, PE		
Author title: BRAC Environmental Coordinator	**Author affiliation:** Air Force Civil Engineer Center	
Review period:** 06/15/2011 to 06/15/2016		
Date(s) of site inspection: 01/06/2016 – 01/07/2016		
Type of review: ☒ **Post-SARA** ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☒ Other (specify) _____4th_____		
Triggering action: ☐ Actual RA On-site Construction at OU #____ ☐ Construction Completion ☐ Other (specify)	☐ Actual RA Start at OU #____ ☒ Previous Five-Year Review Report	
Triggering action date: 9/29/2011		
Due date ***(five years after triggering action date)*:** 9/29/2016		

* ["OU" refers to operable unit.]

372 **Five-Year Review Summary Form (Continued)**
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ISSUES	
Operable Unit (OU)-1	No issues identified.
OU-2	ST012. Soil Action Levels specified in the ROD and ROD Amendment 1 no longer considered to be valid.
OU-3	FT002. A DEUR was filed limiting the use of Site FT002 to non-residential uses.
OU-4	No issues identified.
OU-5	No issues identified.
OU-6	SS017. Final soil and groundwater remedies for OU-6 sites have not been adopted.
RECOMMENDATIONS AND FOLLOW-UP ACTIONS	
OU-1	None identified.
OU-2	Perform a soil-specific FFS to determine appropriate long term remedy for soil, finalize decision documents and implement remedy as needed.
OU-3	Issuance and acceptance of a closure report based on the results of additional RAs implemented in 2015 and 2016 is required for removal of the DEUR and designation of unrestricted use.
OU-4	None identified
OU-5	At DP028, No Further Actions (NFAs) needed (addressed as part of LF004).
OU-6	Complete Amended Proposed Plan and ROD for selected remedy.

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375 **Five-Year Review Summary Form (Continued)**
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PROTECTIVENESS STATEMENTS	
OU-1	The remedy at OU-1 is protective of human health and the environment. Implementation of the selected remedy is achieving the primary RG established in the OU-1 ROD of overall protection of human health and the environment by providing a barrier between the contaminated soil and any potential human or environmental receptors. The selected remedy for soil gas and groundwater specified by the OU-1 ROD Amendment is currently being implemented to achieve the established RAOs.
OU-2	The remedy at OU-2 currently protects human health and the environment because a DEUR, implementing ICs for ST012, was recorded in June 2008 and the current remedy for deep soil and groundwater has been implemented. However, in order for the remedy to be protective in the long-term, a soil-specific FFS is needed to determine appropriate long term remedy for shallow and deep soil based on current standards. Subsequently, decision documents and remedy implementation may be required to ensure protectiveness.
OU-3	The remedy at OU-3 currently protects human health and the environment because a DEUR, implementing ICs for FT002, was recorded in April 2008. However, in order for the remedy to be protective in the long-term, issuance and acceptance of a closure report documenting RAOs have been achieved is required for removal of the DEUR and of unrestricted use as specified in the OU-3 ROD.
OU-4	The remedies at OU-4 is protective of human health and the environment. ICs have been implemented in the form of a DEUR or VEMUR at the five OU-4 sites which require land use restriction specified in the OU-4 ROD.
OU-5	While there were nine sites identified in the OU-5 ROD, only site DP028, the sewage sludge trenches that were addressed under the OU-1 LF004 Landfill cap, triggers the requirement for a five-year review. DP028 is addressed as part of LF004. See OU-1 protectiveness statement.
OU-6	A protectiveness determination of the remedy at OU-6 cannot be made at this time until soil and groundwater remedies have been determined by finalization of a ROD. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017. The dispute resolution is expected to be finalized in May 2016. Subsequently, completion of an amended proposed plan and ROD it is expected to complete in 2017, at which time a protectiveness determination will be made.
OTHER COMMENTS	

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1.0 INTRODUCTION

1.1 Purpose

The U.S. Air Force (AF) has conducted a forth five-year review at the former Williams Air Force Base (AFB), Mesa, Maricopa County, Arizona. This review was conducted from December 2015 to April 2016 by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), under contract to the Air Force Civil Engineer Center (AFCEC). The first five-year review addressed the period of June 1996 to June 2001. In 2006, the second five-year review was developed, but not finalized or signed and covered the period of June 2001 to June 2006. The third five-year review addressed the period of June 2006 to June 2011. This report, organized in accordance with the most current five-year review guidance published by the U.S. Environmental Protection Agency (EPA) (EPA, 2001), documents the results of the review.

The purpose of a five-year review is to determine whether the remedy at a site is or is not expected to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify deficiencies found during the review, if any, and recommendations to address them.

This review is required by statute. A statutory five-year review is required when hazardous substances, pollutants, or contaminants are left on-site above levels that allow for unlimited use and unrestricted exposure (UU/UE) upon completion of remedial actions (RAs). Five-year reviews are also generally conducted as a matter of policy for RAs that will not leave hazardous substances, pollutants, or contaminants on-site above levels that allow UU/UE, but require five years or more to complete. Certain sites at the former Williams AFB have hazardous substances, pollutants, or contaminants left on-site above levels that allow for UU/UE, so the 2016 Five-Year Review is a statutory review.

The AF, the EPA, the Arizona Department of Environmental Quality (ADEQ), and the Arizona Department of Water Resources (ADWR) entered into a Federal Facilities Agreement (FFA) for environmental cleanup at Williams AFB in September 1990. As lead agency of the FFA, the AF must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substance, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The Fourth Five-Year Review has been prepared in accordance with the most recent EPA and AF guidance for conducting five-year reviews and preparing five-year review reports including: Comprehensive Five-Year Review Guidance; (EPA, 2001), Recommended Evaluation of Institutional Controls (EPA, 2011), Clarifying the Use of Protectiveness Determinations (EPA, 2012a), Assessing Protectiveness of Sites for Vapor Intrusion (EPA, 2012b) and Five-Year Review Procedures- Update to DoD Manual (DoDM) 4715.20, "Defense Environmental Restoration Program (DERP) Management," March 9, 2012 (Office of the Under Secretary of Defense, 2014), and tailors the relevant parts of the guidance and supplements to the specific conditions at the former Williams AFB.

1.2 Organization

This five-year review addresses the six operable units (OUs) at the former Williams AFB that fall within the AF Installation Restoration Program (IRP). Many of the individual sites within these OUs did not require any RAs to protect human health and the environment under an unrestricted reuse scenario and therefore do not require five-year reviews. The status of each site, along with a summary of the Record of Decision (ROD) requirements, is presented in Table 1-1.

Table 1-1 Status of Installation Restoration Program Sites

Site	Summary of Requirements	Status	ROD Citation
OU-1			
LF004. Landfill	The Final OU-1 ROD required installation of a permeable cap over contaminated surface soils, installation of an interceptor trench, erection of a fence around the perimeter of the interceptor trench, imposing land-use restrictions, and performing post-closure monitoring for 30 years (including landfill maintenance, annual soil monitoring [i.e., visual inspection of soil cap integrity] and groundwater monitoring). The Final ESD incorporated the Sewage Sludge Trenches (DP028), which were adjacent to the landfill, into the selected remedy. The OU-1 ROD Amendment specified IWAS, Oxidation and SVE as the preferred soil gas and groundwater alternative.	All remedial construction is complete associated with OU-1 ROD and ROD Amendment. The site is undergoing post-closure monitoring and maintenance of the landfill cap in accordance with the OU-1 ROD. SVE and IWAS system operations are ongoing in accordance with the OU-1 ROD Amendment.	AFBCA, 1994. Final Record of Decision, Operable Unit 1, Williams Air Force Base, Arizona. Administrative Record #480. AF, 1995. Final Explanation of Significant Difference for the Operable Unit (OU) 1 Record of Decision. Administrative Record #699.
ST005. UST at Building 789 ST006. UST at Building 725 ST007. UST at Building 1086 ST008. UST at Building 1085 SD010. Northwest Drainage System RW011. Radioactive Instrumentation Burial Area DP013. Pesticide Burial Area SS001. Hazardous Material Storage Area FT003. Fire Protection Training Area	For these sites, Section 1.6 of the Final OU-1 ROD states: "No unacceptable health risks are present at [these] sites, as calculated under a residential exposure scenario during the risk assessment. Therefore, five-year periodic reviews are not required for these sites."	No five-year evaluation required.	AF, 2003. Consensus Statement No. 03-1, Agreement on OU-1 ROD Requirement for Annual Soil Monitoring. AMEC, 2014a. Final Record of Decision Amendment, Operable Unit 1, Site LF004, Former Williams Air Force Base, Mesa, Arizona. Administrative Record #301070.
OU-2			
ST012. Former Liquid Fuels Storage Area	The Final OU-2 ROD requirements included: extraction and treatment of free-phase product and groundwater, with either reinjection or discharge to the base wastewater treatment plant; bio-enhanced SVE treatment of first 25 ft of soil; and ICs. The Final OU-2 ROD Amendment added bio-enhanced SVE for deep soil (defined as occurring from a depth of 25 ft to the top of the groundwater). The Final OU-2 ROD Amendment 2 remedy for groundwater at ST012 is SEE and EBR. The active components of the selected remedy for groundwater will be implemented until the chemical-specific cleanup levels are reached, or analysis of biological and natural attenuation related degradation suggest that contaminants will naturally degrade to the desired concentration within an overall remedial timeframe of approximately 20 years.	Shallow soil remedy completed in accordance with the Final OU-2 ROD. SVE, SEE system operations and groundwater monitoring are ongoing in accordance with the OU-2 ROD Amendment 1 and OU-2 ROD Amendment 2.	IT, 1992a. Final Record of Decision, Operable Unit 2, Williams Air Force Base, Arizona. Administrative Record #316. IT, 1996a. Final Record of Decision Amendment, Deep Soil, Operable Unit 2 (OU-2), Williams Air Force Base, Arizona. Administrative Record #819. AMEC, 2013b. Final Record of Decision Amendment 2, Groundwater, Operable Unit 2 (OU-2), Williams Air Force Base, Mesa, Arizona. 9 September 2013. Administrative Record #1633.

Table 1-1 Status of Installation Restoration Program Sites

Site	Summary of Requirements	Status	ROD Citation
OU-3			
FT002. Fire Protection Training Area No. 2	The Final OU-3 ROD in 1996 required in situ treatment via bioventing of approximately 25,000 cubic yards of soil contaminated with benzene, chloroform, and 1,4-chlorobenzene. However, the RA did not achieve unrestricted cleanup levels.	Initial remedial actions performed, but did not achieve unrestricted cleanup levels. DEUR was finalized in April 2008 to restrict future use of property. Alternative FT02-4: SVE, originally determined to be a protective and viable remedy from the OU-3 ROD, was implemented as the remedial approach June 2014 through June 2015. Additional RA excavations were conducted to remove non-ROD VOC contaminated soil in November 2015 and January 2016. The AF is currently drafting a closure report based on the final results of confirmatory soil and soil gas sampling following the excavations which is expected to be finalized in September 2016.	IT, 1996b. Final Record of Decision, Operable Unit 3 (OU-3), Williams Air Force Base, Arizona. Administrative Record #808.
SD009. Southwest Drainage System	Section 1.6 of the Final OU-3 ROD, dated May 1996, states that "previous remedial actions at SD009 have lowered the health risks associated with exposure to contaminated soil at the site to an acceptable level" and "because the residual soil contamination at SD009 is within health protective levels that permit unrestricted use of and unlimited exposure to the site, a five-year review	No five-year evaluation required.	
OU-4			
SS016. Electroplating/Chemical Cleaning Shop, Building 1085	Establish controls in the form of deed restrictions and the placement of a VEMUR to restrict the site to non-residential use in the future.	Controls were established in the form of a DEUR, which was recorded on 16 January 2009.	IT, 2000a. Final Record of Decision, Operable Unit 4 (OU-4), Williams Air Force Base, Arizona. Administrative Record #1215.
SS019. Former Skeet Range at South Desert Village	Removal of affected surface soil, and installation of a protective cap, followed by ICs (a VEMUR), and compliance with an approved O&M manual. Human habitation of SS019 is allowed in accordance with the ROD, VEMUR, O&M Manual, the Quit Claim Deed between the U.S. Department of Education and ASU, and the Agreement between ADEQ and ASU. Habitation by children under seven years of age is prohibited.	Remedial action complete. Long-term O&M of the cap is ongoing. VEMUR filed in 1999.	
SS020. Firing Range/Skeet Range	Removal of affected surface soil (Firing Range only) and institution of site controls in the form of deed restrictions to prohibit residential use.	Firing Range: RA complete. A DEUR was recorded on 15 September 2008. Skeet Range: A DEUR was recorded on 24 September 2012.	
SS021. Facilities 1020/1051	Establish controls in the form of a VEMUR to restrict the site to non-residential use in the future.	A DEUR was recorded on 20 September 2007.	
SS024. Building 1010 - Entomology	Establish controls in the form of deed restrictions and the placement of a VEMUR to restrict the site to non-residential use in the future.	A DEUR was recorded by the City of Mesa on 14 April 2015.	
SS033. Facility 1004 SD018. Oil/Water Separator-Petroleum, Oil, and Lubricants Area ST022. Aboveground Storage Tanks 556/557 SS023. Building 1069 LF026. Concrete Hardfill	Section 1.4 of the Final OU-4 ROD, dated April 2000, states that these sites "do not pose an unacceptable risk to human health or the environment under a conservative screening level residential exposure scenario; therefore, no RA is required." It further states that these sites may be "released for unrestricted reuse." Therefore, these sites are not subject to the statutory five-year process.	No five-year evaluation required.	

Table 1-1 Status of Installation Restoration Program Sites

Site	Summary of Requirements	Status	ROD Citation
OU-5			
DP028. Sewage Sludge Trenches	Site addressed as part of LF004.	Same as LF004.	AF, 1995. Final Explanation of Significant Difference for the Operable Unit (OU) 1 Record of Decision. Administrative Record #699.
ST025. Airfield UST	Section 1.4 of the Final OU-5 ROD, dated September 1997, states "because the concentrations of contaminants in the residual soil are within health-protective standards and no engineering controls were required as part of the previous removal action, the OU-5 sites may be released for unrestricted use and no five-year review will be required for any OU-5 site."	No five-year evaluation required.	IT, 1997a. Final Record of Decision, Operable Unit 5, Williams Air Force Base, Arizona. Administrative Record #902.
LF026. Concrete Hardfill Drum Removal Area Portion			
WP027. Paint Shop Leachfield			
SS029. Prime Beef Yard			
SS030. Sewage Sludge Stockpile Area (Area 28)			
SS031. Golf Course Maintenance Area			
SS032. Building 1070			
SS034. Munitions Incinerator			
OU-6			
IRP Sites			
SS017. Old Pesticide/Paint Shop	The Draft-Final ROD was developed and reviewed in 2000 and selected excavation of contaminated soils to a depth of 4 meters. Pesticide-contaminated soil would undergo on-site bioremediation, and PCB-contaminated soil would be transported to an existing off-site landfill. The ROD also required continued groundwater monitoring. However, the ROD was not finalized and signed.	In 2001, the contaminated soil was excavated and managed in accordance with the Draft-Final ROD. However, the on-site bioremediation treatment was not successful and ultimately the soil was removed and transported to an off-site landfill. Groundwater monitoring has continued. The AF submitted a Draft Final Amended Proposed Plan for Operable Unit 6 (January 2015) with the selected preferred alternative of No Further Action. A formal alternative dispute was invoked by the EPA and ADEQ. The Draft Final Amended Proposed Plan has not been finalized.	IT, 2000b. Draft-Final Record of Decision, Operable Unit 6 (OU-6), Williams Air Force Base, Arizona.Administrative Record #1129.
SS017. Base Production Well No. 6			

Table 1-1 Status of Installation Restoration Program Sites

Site	Summary of Requirements	Status	ROD Citation
Williams AFB Closeout Areas			
IWF	Refer to Consensus Statement No. 04-1, 4 November 2003 (signed by EPA, ADEQ, and AF representatives on 4 February 2004), which articulates the closure and unrestricted use of the IWF and DP. Neither of these areas were ever contaminated sites at the former Williams AFB. Rather, they were areas used to facilitate the investigation of suspected contamination at the former base by providing locations to decontaminate equipment and to temporarily hold investigative wastes. The AF took proper care not to contaminate these areas while they were in use. "Based on this information the parties to this statement agree that these parcels are suitable for transfer without restrictions". Therefore, these areas, the IWF and DP are not subject to the statutory five-year process (BEM, 2005).	No five-year evaluation required.	NA
DP at Building 1069			NA

Notes:

ADEQ - Arizona Department of Environmental Quality
AF - Air Force
AFBCA - Air Force Base Conversion Agency
ASU - Arizona State University
BEM - BEM Systems, Inc.
DEUR - Declaration of Environmental Use Restriction
DP - Decontamination Pad
EBR - enhanced bioremediation
EPA - U.S. Environmental Protection Agency
ESD - Explanation of Significant Difference
ft - feet, foot
IC - institutional control
IRP - Installation Restoration Program
IT - IT Corporation
IWAS - In-well Air Stripping
IWF - Investigative Waste Facility
NA - not applicable
No. - number
O&M - operations and maintenance
OU - operable unit
PCB - polychlorinated biphenyls
RA - remedial action
ROD - Record of Decision
SEE - steam enhanced extraction
SVE - soil vapor extraction
UST - underground storage tank
VEMUR - Voluntary Environmental Mitigation Use Restriction
VOC - volatile organic compound

The organization of this fourth five-year review follows the outline provided in the EPA's guidance and that established by the first five-year review, and is as follows:

Section 1	Introduction
Section 2	Site Chronology
Section 3	Site Background
Section 4	Remedial Actions
Section 5	Progress Since the Last Review
Section 6	Five-Year Review Process
Section 7	Technical Assessment
Section 8	Issues
Section 9	Recommendations and Follow-up Actions
Section 10	Protectiveness Statements
Section 11	Next Review
Section 12	References
Appendix A	Photo Documentation of Site Inspections in January 2016
Appendix B	Land Use Control /Institutional Control Inspection Checklists

2.0 SITE CHRONOLOGY

2.1 History

Williams AFB opened in 1942 and was immediately commissioned as a flight training school. Throughout its history, pilot training was the primary activity at Williams AFB. At various times, bombardier, bomber pilot, instrument bombing specialist, and fighter gunnery training schools were also housed on base. The base was proposed for closure in 1992 and formally closed on 30 September 1993.

2.2 Implementation of IRP

The IRP was implemented by the U.S. Department of Defense (DoD) in 1980 to identify and control environmental contamination from past hazardous materials use and disposal activities at AF installations. The IRP is DoD's equivalent of the national Superfund program. The Superfund Amendments and Reauthorization Act passed by Congress in 1986 required cleanup of federal facilities to meet Superfund requirements.

2.2.1 IRP Phase I

IRP guidance was received at Williams AFB in July 1983 and the initial assessment study (designated as Phase I) was completed in 1984 (Engineering-Science [ESE], 1984). Based on a review of available records pertaining to chemical handling and disposal practices, interviews with site personnel, and a site survey of activities at Williams AFB, the study identified nine potential sites where hazardous materials may have been handled or disposed.

2.2.2 IRP Phase II

A second investigation (designated as Phase II) was conducted from September 1984 to December 1985 (AeroVironment [AV], 1987). This investigation was initiated to confirm the information in the 1984 report and to verify the presence and quantify the extent of contamination. In 1987, an additional investigation (Phase II, Stage 2) was completed to define the most likely pathways for contaminant migration from each site and to confirm the presence or absence of contamination along those pathways (AV, 1987).

In 1987, a limited RA was performed, which involved design of soil cementing and a concrete cap for a portion of a former drainage system.

In October 1988, the AF contracted for completion of the remedial investigation/feasibility study (RI/FS), proposed plan, and ROD at Williams AFB. The continuation of the RI was initiated in January 1989 to investigate previously identified sites, plus four underground storage tank (UST) sites.

2.3 Federal Facilities Agreement

Williams AFB was added to the National Priorities List (NPL) on 21 November 1989. As a consequence of inclusion on the NPL, negotiations were completed among the AF, EPA, and

state regulatory agencies, and an FFA was signed on 21 September 1990. The FFA established a cooperative and participatory framework among the federal and state agency members, defined their roles and responsibilities, and developed a process to resolve any disputes that may arise during the study and execution phases of the IRP. In addition, the FFA prioritized and scheduled the investigation and RAs at Williams AFB through the designation of OUs that aid in managing these activities. Parties to the FFA included the AF, EPA, ADEQ, and ADWR.

2.4 OU-1

OU-1 was created to address areas identified in previous investigations, plus four UST areas. The OU-1 RI report documented investigation activities performed between 1987 and 1991 (IT, 1992a); additional investigations in 1992 and 1993 are documented in an OU-1 RI report addendum (IT, 1994a). Three sites initially investigated under OU-1 were moved to other OUs; ST012 was moved to OU-2, and SD009 and FT002 were moved to OU-3. A ROD for OU-1 was signed 18 May 1994 (AFBCA, 1994). A Supplemental RI was conducted from May 2007 through August 2009, to further investigate the tetrachloroethene (PCE) and trichloroethene (TCE) soil gas and groundwater contamination (URS, 2010a). Following the preparation of an OU-1 LF004 Focused Feasibility Study (FFS) (AMEC, 2013b) and Amended Proposed Plan for OU-1 LF004 (AF, 2013a), a ROD Amendment for OU-1 was signed in May 2014 (AMEC, 2014a). The OU-1 ROD Amendment selected in-well air stripping (IWAS), in situ chemical oxidation and soil vapor extraction (SVE) as the remedy for TCE and PCE contamination present in groundwater and soil gas at LF004 (AMEC, 2014a).

2.5 OU-2

OU-2 was initially defined as the groundwater contamination and shallow (less than 25 feet [ft] below ground surface [bgs]) soil contamination beneath the Former Liquid Fuels Storage Area (ST012). A groundwater characterization program was initiated in 1989; groundwater compliance monitoring commenced in 1991 and is ongoing. Recovery of floating free-phase fuel at ST012 with skimmer pumps was initiated upon discovery in 1990. By 1997, poor recovery led to discontinuation of the program. The AF contracted the removal of USTs and buried piping in 1991. The OU-2 RI report (IT, 1992c) documented investigation activities performed between 1988 and 1992. Following the preparation of an OU-2 FS (IT, 1992d), a ROD for OU-2 was signed 30 December 1992 (IT, 1992a). Deep soil at ST012 from 25 ft bgs to groundwater was originally incorporated into OU-3 for characterization of the vertical and areal extent of contamination. A deep soil investigation was performed in 1993 and documented in the OU-3 RI report (IT, 1994b). Following characterization, deep soil was reincorporated into OU-2 via an OU-2 ROD Amendment 1 signed in August 1996 (IT, 1996a).

The OU-2 ROD (IT, 1992a) selected an ST012 groundwater remedy that included extraction of light non-aqueous phase liquid (LNAPL) and groundwater by horizontal or vertical extraction wells; separation of LNAPL for reuse or disposal; treatment of extracted groundwater as needed to remove solids and achieve action levels. Installation of vertical and horizontal wells during remedial design established that aquifer yields were too low to achieve hydraulic control of the contaminated groundwater plume area and rising groundwater levels diminished effectiveness of the remedy to achieve hydraulic control and LNAPL recovery (Camp Dresser McKee

[CDM], 1995). EPA and ADEQ concurred with suspending implementation of the original remedy (EPA, 1995) and by 2000, EPA, ADEQ and the AF had agreed that the original OU-2 groundwater extraction remedy would not be effective at achieving RGs at ST012 (EPA and ADEQ, 2005).

A Thermal Enhanced Extraction (TEE) pilot test was performed in 2008 and 2009 to evaluate the effectiveness of TEE technology to enhance LNAPL recovery and remediation of the groundwater contaminant plume at ST012. The TEE pilot test established that it was a possible effective technology for the site (BEM Systems, Inc. [BEM], 2011). Subsequently, the OU-2 FFS evaluated groundwater remediation alternatives for ST012 (AMEC, 2012a). The Amended Proposed Plan identified FFS Alternative ST012-3, Steam Enhanced Extraction (SEE) and Enhanced Bioremediation (EBR), as the preferred groundwater alternative for ST012 (AF, 2013b). The ROD Amendment 2 (AMEC, 2013b) was signed in September 2013 which presented a fundamental change to the ST012 groundwater remedy selected in the OU-2 ROD dated 1992 (IT, 1992a) from a hydraulic extraction remedy to steam enhanced extraction (SEE) and enhanced bioremediation (EBR).

2.6 OU-3

OU-3 was created to investigate the following sites not included in OU-1: the portion of the stormwater drain line from Building 53 to the headworks of SD009, the deep soil at ST012 (moved to OU-2 as discussed in Section 2.5), and Fire Protection Training Area Number (No.) 2 (FT002). Investigations were documented in the OU-3 RI report (IT, 1994b). Following the preparation of an OU-3 FS, a ROD for OU-3 was signed 6 July 1996 (IT, 1996b).

2.7 Facilities Assessment

In 1992, after Williams AFB was nominated for closure, a question of whether all areas on the base with potential contamination had been included in the administrative record led to a facilities assessment conducted between 1992 and 1993 (IT, 1993). The facilities assessment report documented the assessment of 92 facilities/areas at the base. Of these, 30 were recommended for further investigation, 12 were recommended for action as part of the state compliance program, one was recommended for addition as an IRP site, and one area was already identified as an IRP site.

2.8 Evaluation/Assessment

In 1993, the 30 areas identified in the facilities assessment were investigated in the Evaluation/Assessment (E/A). The Final E/A report summarizes the results of this investigation. Areas where the presence and extent of contamination was confirmed were recommended for limited removal action and/or risk screening and were designated as OU-5 sites. Areas recommended for further investigation under CERCLA were designated as OU-4 sites (IT, 1994a).

2.9 Environmental Baseline Survey

An environmental baseline survey (EBS) was performed in 1993 by Halliburton NUS Corporation to document the physical condition of AF real property at the base resulting from the past storage, use, and disposal of hazardous substances and petroleum products (AFBCA, 1993). The survey report documented property status by category. Property designated Categories 1 through 4 was available for immediate transfer. Property designated Category 5 was property where a release of a hazardous substance or petroleum product was known to have occurred and removal and/or RA was underway. Property designated Category 6 was property where a release was known to have occurred, but response actions were not yet implemented. Property designated Category 7 was unevaluated or required additional evaluation. As a result of the AF EBS process for property disposal, action areas were identified (AFBCA, 1993). Those properties designated Categories 5 and 6 ultimately were designated as sites requiring action under the Williams AFB IRP, and were assigned to ongoing or future OU investigations.

2.10 E/A Phase 2, Category 7 Areas

The facilities/areas and aerial photography-defined areas that were designated Category 7 in the EBS were re-evaluated based on results of E/A activities and reassigned for a Category 7 investigation. The five Category 7 facilities/areas and two aerial photography-defined areas were investigated in 1995 and approved for No Further Action (NFA) (IT, 1995a).

2.11 OU-4

The sites that comprise OU-4 were investigated in 1995 and documented in the OU-4 RI report (IT, 1997b). Two supplementary investigations of the Old Pesticide/Paint Shop (SS017) resulted in the transfer of SS017 to OU-6 for final characterization. An RA completed in 1998 consisted of soil removal from the backstop at the Firing Range (SS020) and removal of 6 inches of top soil and replacement with clean soil at the Former Skeet Range at South Desert Village (SS019) (HydroGeoLogic, Inc. [HGL], 2003a). An operations and maintenance (O&M) manual (IT, 1999a) for the protective soil cap at the South Desert Village, an institutional control (IC) implementation agreement between Arizona State University (ASU) and ADEQ, a draft deed, and draft Voluntary Environmental Mitigation Use Restriction (VEMUR) for affected OU-4 sites are all included in the OU-4 ROD (IT, 2000a). Note: Since the signing of the ROD, the state of Arizona VEMUR process has been replaced by Declaration of Environmental Use Restriction (DEUR).

2.12 OU-5

An action memorandum was issued in 1995 outlining removal actions recommended for seven of the nine OU-5 sites (ST025, LF026, WP027, SS029, SS031, SS032, and SS034 [see Table 1-1]) (IT, 1995b). It was subsequently determined that SS032 did not pose an unacceptable risk to human health or the environment, and a removal action was not warranted (IT, 1996c). Removal actions were performed at the six remaining sites in 1995 and documented in the OU-5 RI report (IT, 1996c). The OU-5 ROD (IT, 1997a) specified NFA for the seven sites as well as for SS030, the Sewage Sludge Stockpile Area (Area 28), where no action was required since the site did not pose an unacceptable risk to human health or the environment. The OU-5 ROD documented that, per the *Final Explanation of Significant Difference for the OU-1 Record of Decision* (AF, 1995),

DP028 (sewage sludge trenches) was capped as part of LF004 RAs. Since DP028 is capped within LF004, it is further addressed with OU-1 for the purposes of the Five-Year Review.

2.13 OU-6

OU-6 was created to investigate groundwater at the Old Pesticide/Paint Shop (SS017) and became the final OU at the former base. Four groundwater wells at SS017 were installed in 1998 and sampled semiannually in 1998, 1999, and 2001. The same wells were sampled quarterly in 2002 and 2003, and annually thereafter. Closure activities in 1997 at Base Production Well No. 6 (BPW6) documented a spill of polychlorinated biphenyls (PCBs); the site was added to SS017. As part of the final base closeout activities, two areas (the Investigative Waste Facility and Decontamination Pad) associated with RIs were also added to OU-6. OU-6 sites and areas were investigated in 1998 and documented in the OU-6 RI report (IT, 1999b) and the OU-6 FS (IT, 2000c). A soil removal action at the two SS017 sites to remove dieldrin and PCB-contaminated soil was completed in 2001 per the *Final Action Memorandum, Spill Site 17* (BEM, 2000). Soil from the Old Pesticide/Paint Shop was transferred to a Temporary Treatment Facility (TTF) located northeast of the former landfill (LF004) for bio-treatment. On-site treatment of the excavated soil did not achieve treatment goals; therefore, the soil was disposed at a permitted Resource Conservation and Recovery Act (RCRA) Subtitle D landfill as non-hazardous waste in 2007. Old Pesticide/Paint Shop and BPW6 excavation activities, including closure of the TTF, are documented in a Revised Final OU-6 Removal Action Completion Report (RACR) (URS, 2013).

3.0 SITE BACKGROUND

3.1 Physical Characteristics

The former Williams AFB is located in Maricopa County, Arizona, approximately 30 miles southeast of Phoenix (Figure 3-1). The former base lies within the boundaries of the City of Mesa, adjacent to the towns of Gilbert, Queen Creek, and portions of unincorporated Maricopa County. The locations of the sites undergoing a five-year review are presented in Figure 3-2.

Ownership of much of the former base has been transferred to various municipal, tribal, and government entities. Additional land transfer actions are planned after the successful implementation of remedies at remaining sites. Certain sites are located within or near populated areas of the former base. None of the sites reviewed are reported to be located in or near environmentally sensitive areas.

3.2 Land and Resource Use

Williams AFB, constructed on 4,043 acres, was commissioned as a flight training school in 1941. Runway and airfield operations, industrial areas, housing, and recreational facilities were located on the base. Throughout its history, pilot training was the primary activity at Williams AFB. At various times, bombardier, bomber pilot, instrument bombing specialist, and fighter gunnery training schools were also housed on-base.

The base was proposed for closure in 1992, formally closed on 30 September 1993, and transitioned from the AF's Air Education and Training Command to the AFBCA. This agency worked with the local community through the Restoration Advisory Board (RAB) and the Williams Redevelopment Partnership to maximize reuse for aviation, education, commercial, and industrial uses. The Williams Gateway Airport Authority (WGAA) opened Williams Gateway Airport (now Phoenix-Mesa Gateway Airport) in 1994. The airport initially operated under a lease agreement, then acquired ownership of the airport facilities (3,019 acres) in 1998.

In 1994, the WGAA – with participation from representatives of Apache Junction, Chandler, Gilbert, Mesa, Queen Creek, Maricopa County, Pinal County, and the Maricopa Association of Governments – initiated a regional planning study, which was completed in 1996. This study evolved into a master plan, the purpose of which was to: (1) develop a land use plan to maximize the economic development potential of the airport and surrounding area, (2) minimize future land use conflicts, and (3) establish a regional land use framework. The recommended land uses included restriction of development to commercial/industrial and aviation-related uses only within the projected 65 decibel noise level contour. Within the former base, current and anticipated future land use is compatible with existing industrial and residential areas. In 2009, the WGAA name was changed to the Phoenix-Mesa Gateway Airport Authority (PMGAA).

Development by PMGAA, ASU, and the Gila River Indian Community (GRIC) is ongoing. Phoenix-Mesa Gateway Airport has become a passenger and cargo reliever airport for Phoenix Sky Harbor International Airport. The Williams Campus – a consortium of educational institutions including ASU Polytechnic Campus and Maricopa Community College – is a major aviation

educational, training, and research center, with an estimated student population of 20,000. Reuse of military housing for faculty and students is an integral part of the campus. The GRIC owns and operates the former Williams golf course as Toka Sticks Golf Course, and is considering development of a 144-acre parcel along the southern portion of the former base.

No perennial surface water features occur at the former base; runoff from rainfall events are channeled into drainage canals. Neither surface water nor the upper groundwater aquifer is used as a source of drinking water at the former base. Existing production wells provide drinking water from a separate deep aquifer. Ownership of the water infrastructure has been transferred to the City of Mesa; integration of the base system with the City of Mesa water distribution system has been completed (IT, 2001).

3.3 History of Contamination, Initial Response, and Contaminants

As at many CERCLA sites, the history of contamination discovery and response at the former Williams AFB is complex. Assignment of site designations and grouping of sites into OUs occurred after the discovery of contamination at certain sites, while others were identified after the IRP process had begun. Contamination and initial response activities will be discussed site-by-site by individual OUs for those sites requiring a five-year review, as indicated in Table 1-1.

3.3.1 OU-1 Site, LF004 (Landfill)

The 34-acre landfill (LF004) is located in the southwest corner of the former base, adjacent to the wastewater treatment plant (WWTP) (Figure 3-3). LF004 is located at the southwest corner of the former Williams AFB boundary and is bounded by Old Pecos Road to the north, South Power Road to the west, and East Pecos Road to the south. LF004 is part of a 140-acre parcel of the former Williams AFB that is identified as Parcel N. The LF004 area is partially located in the Southwest Germann Archeological Site. During its operation from 1941 to 1976, the landfill reportedly received mainly domestic trash, as well as wood, metal, and landscape and construction debris. Prior to 1973, dried sewage sludge from the WWTP was taken to LF004. Some solvents and chemicals may have been dumped along with the trash. Disposal occurred in trenches, resulting in a fill depth of 25 to 35 ft. During the 1940s and 1950s, landfill material was routinely burned.

A former above ground storage tank (AST), located northeast of LF004, was a privately-owned 1,680,000-gallon tank used to store jet propulsion fuel grade four (JP-4). The AST was used to supply smaller JP-4 reservoir ASTs at Facilities 556 and 557, as well as former USTs in the Liquid Fuels Storage Area (ST012, OU-2) via an 8,000 ft pipeline (AFBCA, 1993). Historical aerial photographs of the area show that the AST was constructed by 1989 (URS, 2010). The AST was taken out of service in 1993 (AFBCA, 1993).

The IRP Phase I records search in 1984 identified the landfill as an area where past disposal practices may have resulted in contamination. During the IRP Phase II, Stage 1 investigation in 1985 (AV, 1986), seven soil borings were drilled and sampled to a depth of 83.5 ft bgs. During IRP Phase II, Stage 2 activities, one shallow (LF01-LA06) and five deep (LF01-LA01 through LF01-LA05) groundwater monitoring wells were installed and sampled. During the OU-1 RI in 1989, six additional shallow groundwater monitoring wells (LF01-W07 through LF01-W12) were

installed and sampled, and 10 surface soil samples were collected and analyzed in 1991 (IT, 1992b). The RI addendum was subsequently published, which provided additional information for site-specific background metals and additional LF004 groundwater results collected between January 1992 and October 1993 (five sampling events and two 24-hour purging tests conducted to determine if LF004 was the source of nickel and chromium in groundwater at the site) (IT, 1994c).

Several pesticides and semivolatile organic compounds (SVOCs) were detected on a recurrent basis in surface samples, with the most prevalent being 4,4'-dichlorodiphenyltrichloroethane, its degradation products, dichlorodiphenyldichloroethene, dichlorodiphenyldichloroethane, and dieldrin. Other compounds detected in surface soil samples included low levels of phthalates and polynuclear aromatic hydrocarbons (PAHs) (chrysene, benzo[a]pyrene, and acenapthene). Beryllium, copper, and zinc were consistently detected above base-specific background concentrations. The OU-1 FS concluded that because upper confidence limit concentrations of beryllium and dieldrin in LF004 surface soil were above the preliminary remediation goals (PRGs), these constituents were present at levels that potentially presented a human health risk and required remediation (IT, 1994c).

Low but measurable quantities of benzene, toluene, and ethylbenzene were detected in the most upgradient deep well (LA-02); the source of these volatile organic compounds (VOCs) was unidentified. Benzene, toluene, ethylbenzene, and total xylenes (BTEX) constituents, phthalates, and various halogenated compounds including PCE, TCE, and bromochloromethanes were also detected in groundwater samples at concentrations less than 5 micrograms per liter (µg/L). The metals beryllium, cadmium, and copper were detected above background concentrations (IT, 1994c). Nickel and chromium in groundwater were determined to be the result of stainless-steel well construction materials rather than from a contaminant source from LF004 (IT, 1994c). The OU-1 FS concluded that groundwater within the vicinity of LF004 did not require remediation to meet PRGs and recommended NFA, but that groundwater sampling be continued to monitor for chemicals of potential concern (COPCs) (IT, 1994d).

Potential remedial alternatives for LF004 were evaluated in the OU-1 FS (IT, 1994d), which recommended capping the landfill as the preferred alternative.

The Supplemental RI was conducted, from May 2007 through August 2009, to further investigate the PCE and TCE soil gas and groundwater contamination (URS, 2010). The source area investigation was conducted using a phased approach to increase the probability of identifying the source of the PCE and TCE groundwater contamination. During the Supplemental RI, shallow soil gas samples (less than 15 ft bgs) were collected and deep borings were installed for further investigation based on the shallow sample results. Soil gas results from shallow soil gas sampling and from deep soil borings identified an area northeast of the landfill (in the vicinity of the former AST) where PCE and TCE are present in the unsaturated zone from the shallow subsurface to the water table. These results are indicative of a source area for PCE and TCE in groundwater near the former AST and downgradient of this area. These results support the conceptual site model (CSM), which attributes the increase in concentrations of PCE and TCE in groundwater to regionally-rising groundwater levels that may be encountering contaminant mass present in the unsaturated zone at the site. PCE and TCE detections in soil gas results from shallow soil borings

and deep soil borings located at the southeast portion of the landfill, in the vicinity of the linear feature observed on the 1964 aerial photograph, could potentially be indicative of a source area; however, these detections are lower (an order of magnitude) than TCE detections observed at the former AST area.

During the Supplemental RI (URS, 2010), groundwater screening samples were collected from 21 on-site deep soil borings and three off-site borings located southeast of LF004. These samples were collected to delineate groundwater contamination south of LF004. Multiple groundwater sampling events were performed at LF004 during the Supplemental RI field work (URS, 2010). Two contaminants, PCE and TCE, exceeded EPA drinking water maximum contaminant levels (MCLs) and Arizona aquifer water quality standards (AWQS). TCE was detected in 20 of 24 samples with results exceeding the drinking water MCL (5 µg/L) in 13 samples, all located on-site. TCE was detected in one of the three off-site samples with a TCE concentration (0.24 µg/L) less than the MCL. The maximum TCE concentration (89.0 µg/L) was located in the former AST area southeast of the AST. PCE was detected in 20 of 24 samples with results exceeding the drinking water MCL (5 µg/L) in 15 samples, all located on-site. PCE was detected in one of the three off-site samples with a PCE concentration (0.79 µg/L) less than the MCL. The maximum PCE concentration (40 µg/L) was located southeast of LF004 adjacent to monitoring well LF01-W19.

3.3.2 OU-2 Site, ST012 (Former Liquid Fuels Storage Area)

OU-2 is composed of one IRP site – the Former Liquid Fuels Storage Area, designated ST012 (Figure 3-4). The site, located south of East Ulysses Avenue between South Sossaman and South Avoca, was selected during the IRP Phase I records search and site assessment as an area where past activities may have contributed to contamination (ESE, 1984). During a Phase II, Stage 1 investigation in 1986, soil borings to 45 ft bgs were drilled and sampled (AV, 1986). The investigation continued as Phase II, Stage 2 in 1986 and 1987, which included drilling and sampling additional soil borings, performing soil gas sampling, and installing and sampling groundwater monitoring wells (AV, 1987). These investigations documented contamination by JP-4 and aviation gasoline in shallow soil and groundwater, but did not define the extent of the contamination. The site was designated as OU-2 and investigated further.

The OU-2 RI (IT, 1992c) consisted of two soil-gas surveys and five follow-up soil borings in 1988 which, in addition to those installed by AV, identified shallow subsurface soil contamination near banks of USTs and fuel distribution piping. In response to the RI (IT, 1992c), in 1991, the AF contracted the removal of all USTs and piping as a source removal action. Groundwater sampling and measurement of LNAPL commenced in 1989 and continues as an annual event. The volume of free-phase product at ST012 was estimated to be greater than 1 million gallons, and the volume of potentially contaminated groundwater was estimated at 170 million gallons. IT performed a baseline risk assessment for COPCs detected from soil borings and initial groundwater sampling at ST012. COPCs were defined and evaluated for surface soil, subsurface soil, and groundwater pathways. Of these, benzene was determined to be the COPC for groundwater, and benzene and 1,4-dichlorobenzene were determined to be COPCs for shallow soil. Results of soil borings, initial groundwater sampling, and the risk assessment were produced in an OU-2 RI report (IT, 1992c). Following the issuance of the OU-2 FS report (IT, 1992d), a ROD was signed in 1992 (IT, 1992a).

During the preparation of the OU-2 RI, the AF recognized the need for further nature and extent investigation for deep soil contamination at ST012, moved the deep soil into OU-3 for further study, and pursued a remedy for shallow soil and groundwater. Deep soil at ST012 was investigated in 1993 under the OU-3 RI. Results of deep soil characterization and contaminant fate and transport modeling indicated a deep source of fuel hydrocarbons that would impact groundwater. Deep soil was returned to OU-2 in 1996 with the OU-2 ROD Amendment 1, which selected a synergistic deep soil cleanup remedy of SVE, bioventing, and natural attenuation (IT, 1996a).

The OU-2 remedy for groundwater defined in the OU-2 ROD (IT, 1992a) was subsequently replaced by the OU-2 ROD Amendment 2 (AMEC, 2013b) selected remedy following numerous RA and treatability studies detailed in Section 4.2.2.2.

3.3.3 OU-3 Site, FT002

Fire Protection Training Area No. 2 (FT002) is located on approximately 8.5 acres near the southern area of the former Williams AFB (Figure 3-5). The area was used for AF fire protection training exercises between 1958 and 1991. Waste solvents, hydraulic fluids, oils, and fuel were burned at the area until approximately 1968. After that, JP-4 was used reportedly two to three times a week until the mid-1970s. Then, reportedly eight to 12 training exercises a quarter were typical until the facility was closed in 1991 (ESE, 1984).

During the 1950s and 1960s, up to 1,000 gallons of flammable liquids were used per training exercise. The volume of combustible material decreased to approximately 600 gallons per event in the 1970s, and again to 300 gallons per exercise from the 1980s, until the facility was closed. Extinguishing agents used until the early 1970s included protein foam and chlorobromomethane. More recently, aqueous film-forming foam, halon, and dry chemicals were used (ESE, 1984).

The training area initially consisted of a shallow pit, which held the flammable material. Water was applied to the pit before each burn to minimize the impact of flammable liquids. Not all flammable material was consumed during each exercise; the remaining material either volatilized or soaked into the ground. In 1983, the training area was reconstructed to have two burn pits. During subsequent training, water and an extinguishing agent filled the liner. Material that overflowed the liner either volatilized or soaked into the ground (ESE, 1984).

FT002 was identified during the Phase I records search in 1984 as an area where past activities may have resulted in contamination, and the area was assigned the IRP designation FT002 (ESE, 1984). During the IRP Phase II, Stage 1 investigation in 1986, 15 soil borings were drilled and sampled to a maximum depth of 25 ft bgs (AV, 1986). During Phase II, Stage 2 activities in 1987, an additional 22 borings were drilled and sampled to a maximum depth of 210 ft bgs, and five groundwater monitoring wells were installed and sampled (AV, 1987)

During the OU-1 RI, ongoing groundwater sampling was performed. At that time, between January 1991 and December 1992, the water table rose in well F2-02 (well which represented the average depth-to-groundwater at the site at that time) from 243 ft bgs to 237 ft bgs. An additional deep well was installed in 1989, but abandoned in 1991 because it was dry. A soil

boring was drilled in 1989 at an angle beneath the larger burn pit and sampled for VOC contamination that predated the concrete liner. FT002 was placed into OU-3 in 1994 for further study. Three surface soil samples were collected and analyzed for PAHs in 1994 (IT, 1994b).

Results of soil sampling during the RI documented the presence of VOCs (methyl ethyl ketone, BTEX, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and methylene chloride) and petroleum hydrocarbons to a depth of about 76 ft bgs at the eastern burn pit, and shallow soil (to about 2 ft bgs) contamination with BTEX and total petroleum hydrocarbons (TPH) at the western burn pit. No PAH contamination was reported in the surface soils. Groundwater sampling during the RI documented the absence of contamination from the overlying soil (IT, 1994b).

3.3.4 OU-4 Sites

Locations of OU-4 sites are displayed in Figure 3-2.

3.3.4.1 SS016, Electroplating/Chemical Cleaning Shop, Building 1085

The electroplating/chemical cleaning shop (Building 1085, also known as SS016) is located at 6308 South Taxiway Circle. Electroplating and chemical cleaning were performed in the facility from 1961 until the early 1990s. Chromium plating machinery and yellow floor stains were associated with the electroplating shop (Figure 3-6). The chemical cleaning shop contained solvent vats labeled as PCE-containing and was underlain by a corroded and pitted concrete floor. Volumes of wastes are unknown. USTs associated with plating waste have been identified and removed under the IRP.

During the E/A (IT, 1994a), soil sampling beneath the concrete floor of the electroplating room identified metals above EPA Region IX residential PRGs and Arizona residential health-based guidance levels (HBGLs), but within base-specific and regional background ranges. An attempt to collect a soil sample beneath the concrete floor of the chemical cleaning room was unsuccessful, but solvent odors were noted during the attempt. Both the electroplating room and the chemical cleaning room were recommended for further investigation under OU-4, and the site was designated SS016.

During the OU-4 RI in 1995, concrete floors were cored to allow drill access for five borings in the electroplating room and six borings in the chemical cleaning room. Soil borings were drilled and sampled to 50 ft bgs. Analytical results documented the presence of VOCs (toluene, TCE, and PCE) below regulated levels to depths of 10 ft bgs, and metals (arsenic, beryllium, chromium, and lead) at various depths. Lead in soil exceeded the Arizona minimum Groundwater Protection Limits (GPLs) in one sample (IT, 1997b).

In 1997, soil samples were collected to obtain additional data to support the calculation of a site-specific GPL for lead. The calculated site-specific GPL for lead is 646.5 milligrams per kilogram (mg/kg). The maximum detected value does not exceed the calculated GPL, so groundwater will not be impacted by lead from this site.

The baseline risk assessment performed in the OU-4 FS (IT, 1997c) concluded there was no unacceptable risk to occupational workers in a non-residential scenario at SS016. Due to the

912 presence of lead at concentrations exceeding levels allowable for unrestricted use, the FS
913 recommended a preferred alternative of ICs.

914 #### 3.3.4.2 SS019, Former Skeet Range in South Desert Village

915 A six-station Skeet Range (SS019) located south of the old Southwest Drainage System just east
916 of West Perimeter Road (now South Lennox) was demolished and graded in 1950, prior to
917 construction of the base housing units, now known as the South Desert Village.
918
919 The location of the Skeet Range firing line was transposed from aerial photographs onto a map
920 of the South Desert Village during the E/A (IT, 1994a). Five soil samples were collected from a
921 depth of 1 ft bgs at locations selected to be representative of the area affected by lead shot and
922 analyzed for metals. Analysis returned one lead value that exceeded all regulatory levels; based
923 on this finding the area was assigned IRP designation SS019 and recommended for further
924 investigation during OU-4 (IT, 1997b).
925
926 During the OU-4 RI in 1995, visible lead shot and broken skeet targets that had been brought to
927 the surface by widespread rodent burrowing were observed. Five soil samples were collected
928 6 inches below any detected lead pellets to test for lead leaching. Analytical results documented
929 that lead contamination was not a threat to groundwater at the site (IT, 1997b).
930
931 During a supplemental investigation conducted in 1996, nearly 1,100 locations were bored with a
932 hand auger in 6-inch lifts to a total depth of 2 ft bgs, and approximately 100 locations were bored
933 to a total depth of 4 ft bgs. All samples were wet sieved, the lead pellets counted and documented,
934 and shot density maps were prepared.
935
936 The Arizona HBGL for lead in soil at the time of the ROD preparation in a residential scenario was
937 400 mg/kg. This level was adopted as a surrogate PRG for an upper-bound estimate of lead
938 available for ingestion, and a conversion of lead pellet abundance to potential lead in soil was
939 derived. Lead pellet count data were then used to generate a map of the South Desert Village
940 that delineated the surface area where lead values in soil could be expected to exceed the PRG
941 (Figure 3-7). The OU-4 FS (IT, 1997c) evaluated remedial alternatives for SS019 and
942 recommended the excavation and disposal alternative with ICs as the preferred alternative.

943 #### 3.3.4.3 SS020, Firing Range/Skeet Range

944 The base Firing Range (Facility 927, also known as SS020) and nearby Skeet Range (also part
945 of SS020) are located on the northern edge of the former base, just south of Perimeter Road, and
946 north of the intersection of Taxiway No. 5 and the east runway (Figure 3-8). The Firing Range
947 was in operation for small arms target practice from 1961 to 1992. The Skeet Range location is
948 visible on aerial photographs from the same time frame and was demolished during construction
949 of the east runway.
950
951 During the E/A activities in 1993, visual inspection of the earthen backstop at the Firing Range
952 revealed evidence of lead bullets of various calibers, and visual inspection of the Skeet Range
953 indicated the presence of expended shotgun shells and broken clay targets. Samples were
954 collected from surface soils at six locations at the Firing Range and two locations at the Skeet

Range. Samples returned lead values above base-specific and regional background ranges and above EPA Region IX residential PRGs and Arizona residential HBGLs. The areas were assigned the IRP designation SS020 and recommended for further investigation in OU-4 (IT, 1994a).

During the OU-4 RI in 1995, 13 soil borings at the Firing Range were sampled at depths of 1, 2, and 3 ft bgs, and 14 borings at the Skeet Range were sampled at a depth of 1.5 ft bgs. Samples from the backstop exceeded the EPA Region IX residential PRG, the Arizona residential HBGL, and the minimum Arizona GPL. Two of the samples exceeded the calculated site-specific GPL of 1,340 mg/kg. The samples from the Skeet Range documented the absence of lead in soil above background levels. The lead in the backstop represented a threat to human health and potentially a threat to groundwater (IT, 1997b). The OU-4 FS (IT, 1997c) evaluated remedial alternatives for SS020 and recommended the excavation and disposal alternative with ICs as the preferred alternative.

3.3.4.4 SS021, Facilities 1020/1051

SS021 includes Facility 1020, the firing buttress, constructed in 1942, and Facility 1051, the Bore Sighting bunker, constructed in 1958 (Figure 3-9). Both facilities are located along East Pecos Road near the south-central part of the former base. Both facilities contained hazardous materials (lead bullets) that have been removed.

The facilities assessment report indicates that backstop sand and any associated lead bullets had been removed from the facilities and that no bullets were visible on the nearby ground surface during a site inspection in 1992. Site inspection during the EBS in 1993, however, documented the presence of spent bullets and shell casings on the surface near both facilities and spilled paint on the ground surface near Facility 1051 (AFBCA, 1993) . The lack of site-specific sampling and analysis for lead in surface soil presented a data gap, so the areas were assigned the IRP designation SS021 and recommended for further investigation under OU-4.

During the OU-4 RI in 1995, a site inspection was performed to document the extent of spent bullets, shell casings, and disturbed and/or non-indigenous surface soil in the vicinity of the facilities. The interpretation of the findings was that the removed soil had been spread out in a thin layer in the vicinity of each bunker. Six shallow soil borings were drilled and sampled at a depth of 0.5 to 1 ft bgs, which was below any observed bullets or casings. Analytical results documented that lead concentrations at the sites represent no threat to human health and the environment under current or future land use (IT, 1997b).

In 1996, site walkovers of both facilities were performed in conjunction with other basewide unexploded ordnance (UXO) removal actions to confirm the absence of UXO. No spent rounds of high-caliber explosive ammunition were found. A visual and geophysical survey was performed in the vicinity of Facility 1020 in 1996 to investigate a report from a former AF member that outdated ammunition had been buried in nearby trenches. The survey and subsequent exploratory trenching found no evidence of buried ammunition (IT, 1996d).

The baseline risk assessment performed in the OU-4 FS concluded that there was no unacceptable risk for either residential or non-residential land use at SS021. However, because

of the observed bullets on the ground surface, the OU-4 FS (IT, 1997c) evaluated remedial alternatives for SS021 and recommended ICs as the preferred alternative.

3.3.4.5 SS024, Building 1010

Building 1010 was known as the base pesticide (entomology) shop, and is located near the southwest corner of the base, south of East Pecos Road (now Old Pecos Road) and north of the WWTP (Figure 3-10). It was constructed in 1983 and contained various hazardous materials: non-friable asbestos-containing materials, PCBs (less than 50 mg/kg), and pesticides. Because no sampling data for contamination evaluation existed for the building and the surrounding fenced yard, the area was assigned the IRP designation SS024 and recommended for further investigation under OU-4.

During the OU-4 RI in 1995 (IT, 1997b), the north bay of Building 1010 and the surrounding fenced yard were sampled. Twelve shallow soil borings located in the yard were drilled and sampled from depths ranging from 0.35 to 3.7 ft bgs, and 12 hexane-saturated wipe samples were collected from stained concrete, painted wood, and steel surfaces in the north bay.

Analytical results of soil sampling in the surrounding yard documented the near-surface presence at scattered locations of four pesticides (alpha-chlordane, dieldrin, gamma-chlordane, and heptachlor) and one SVOC (pentachlorophenol) above EPA Region IX residential PRGs and Arizona residential HBGLs. Analytical results of wipe samples from the north bay of the building documented the presence of several pesticides in surface stains (IT, 1997b).

The baseline risk assessment performed in the OU-4 FS (IT, 1997c) concluded that there was no unacceptable risk for an occupational worker in a non-residential land use scenario at SS024. Due to the presence of multiple pesticides and pentachlorophenol at concentrations exceeding levels allowable for unrestricted use, the FS recommended a preferred alternative of ICs.

3.3.5 OU-5 Sites, DP028, Sewage Sludge Trenches

The sewage sludge trenches (DP028) were located east of the base WWTP on the southwest corner of the base, just south of Old Pecos Road (Figure 3-3). Information obtained from visual inspection and aerial photographs indicate that the trench area consisted of three trenches ranging in length from approximately 140 to 350 ft and 40 to 50 ft wide. According to the IRP Phase I records search, the WWTP digesters were out of service from 1973 to 1979, and undigested sludge was directed to the trenches adjacent to the plant. In 1976, the base removed sludge collected since 1973 from the trenches and disposed of it in a base landfill. In 1979, when the digesters were reactivated, the undigested sludge collected from 1976 to 1979 was also buried in the trenches.

During the E/A in 1993 (IT, 1994a), soil samples were collected from a depth of 10 to 20 inches from six locations. Analytical results documented the presence of arsenic, beryllium, dieldrin, and benzo(a)pyrene at concentrations above EPA Region IX residential PRGs. The area was assigned the IRP designation DP028 and placed into OU-5 for removal action. No action at DP028 was conducted during the OU-5 activities because the sewage sludge trenches were capped as part of the remedy for the landfill (LF004) under OU-1, as documented in the OU-1 explanation of

significant difference (ESD) (AF, 1995). This action was taken because of the close proximity and common contamination (dieldrin) at both the landfill site and sewage sludge trenches (IT, 1995c).

3.3.6 OU-6 Sites

The locations of OU-6 sites are displayed in Figure 3-11.

3.3.6.1 SS017, Old Pesticide/Paint Shop

The Old Pesticide/Paint Shop (also previously identified as Facility 722) was located in the west-central area of the former Williams AFB. The site is located northeast of the water tower, east of South Sagewood Street, north of East Williams Campus Loop South, and west of South Williams Campus Loop West (Figure 3-11). According to former Williams AFB records, only pesticides were stored and mixed at the shop prior to 1960. After 1960, paint reportedly was stored at the shop, but not mixed or disposed. A former paint shop employee reported that the practice at the old pesticide shop from at least 1965 until 1975 was to dispose of unused pesticide mixtures on the ground outside the building (IT,1994a). The building was demolished and the site was graded in the early 1970s. Most of the former site of Facility 722 is currently surrounded by chainlink fencing related to the water supply and storage facilities of the former base.

During the E/A investigation in 1993, five soil samples were collected from the suspected location of the facility at a depth of 10 to 17 inches bgs. Analytical results documented the presence of dieldrin above EPA Region IX residential PRGs and Arizona residential soil remediation levels (SRLs) (IT, 1994a). Based on the analytical results for dieldrin, it was assigned the IRP designation SS017 and further investigation at this area was recommended during OU-4.

During the OU-4 RI in 1995, six soil borings were drilled and sampled at SS017 to a depth of 30 ft bgs, and two shallow soil samples were collected from areas thought to be located in a background setting. Analytical results confirmed the presence of several pesticides, but only dieldrin was above EPA Region IX PRGs and Arizona SRLs. Contamination was highest in the top 8 ft of soil but was detected from samples at the bottom of the borings. Lead values were reported at higher than background values, but were not considered indicative of disposal. One background soil sample collected near the water tower returned an anomalously high value for lead (IT, 1997b).

An expanded OU-4 investigation was conducted at SS017 in 1996 to determine the lateral and vertical extent of surface and subsurface pesticide contamination at SS017. Ten soil borings were drilled and sampled; four to a depth of 170 ft bgs (at or just above the current water table) and six to a depth of 100 ft bgs. Twenty-five randomly selected surface soil samples were also collected from a 20-ft grid established at the site. A turbid, unfiltered groundwater grab sample was collected from approximately 170 ft bgs from one boring (IT, 1999b).

Analytical results of surface sampling defined an area within the fenced yard at SS017 in which soil contained dieldrin above the Arizona residential SRL of 0.28 mg/kg. Analytical results from soil collected in borings placed in the suspected disposal site documented the presence of dieldrin at isolated depths from the surface to just above groundwater at a depth of 170 ft. No VOCs were reported in any soil sample at concentrations exceeding screening levels (IT, 1999b).

Dieldrin, alpha-chlordane, and endrin ketone were detected at concentrations of 0.76 µg/L, 0.032 µg/L, and 0.03 µg/L, respectively, from the groundwater grab sample collected during the expanded OU-4 investigation. Dieldrin was the only compound that exceeded the EPA Region IX PRG (0.0042 µg/L); therefore, it was the only pesticide carried forward as a chemical of concern (COC). The turbid and unfiltered nature of the groundwater grab sample led to a question about the actual levels of dissolved dieldrin in groundwater at SS017; therefore, the site was transferred from OU-4 to OU-6 for further investigation of groundwater (IT, 2000c).

In 1998, four groundwater monitoring wells were installed at SS017 in the upper aquifer and sampled in conjunction with the OU-6 RI. These wells consisted of one upgradient well (SS017-MW01), one well in the vicinity of the known contamination (SS017-MW02), and two downgradient wells (SS017-MW03 and SS017-MW04) (IT, 1999b).

In February 1999, the *Final Remedial Investigation Report for Operable Unit 6* (IT, 1999b) was completed, which included an evaluation of human health risks posed by the site. At that time, no contaminants (including dieldrin) had been detected in samples from groundwater monitoring wells, so the risk assessment did not evaluate risk to human health from exposure to groundwater. The first detections of dieldrin in groundwater occurred in April 1999.

In February 2000, the *Final Feasibility Study Report for Operable Unit 6* (IT, 2000c) was completed. At that time, there had been four rounds of groundwater sampling, with only two detections of dieldrin (the highest detection being from upgradient well SS017-MW01). Accordingly, the FS acknowledged that groundwater would be added as an exposure pathway, but did not recalculate the risks for the baseline human health risk assessment due to the limited amount of data. Instead, the FS indicated that risks to human health from exposure to groundwater would be evaluated by comparing sample results to (risk-based) PRGs for dieldrin.

The OU-6 FS report recommended soil excavation, backfill, and bioremediation as the preferred alternative for SS017 dieldrin-contaminated soil. Groundwater would be monitored for dieldrin (IT, 2000c). The OU-6 Proposed Plan was issued for public review and comment on 03 March 1999. However, the associated OU-6 Draft Final ROD (IT, 2000b) was never finalized or signed.

In 2001, the AF initiated quarterly groundwater monitoring of the four groundwater monitoring wells. Dieldrin concentrations were relatively stable with many results being non-detections. Accordingly, in 2004, the monitoring frequency was reduced to annual and continues to date. The *Final Site SS017 Old Pesticide/Paint Shop Groundwater Monitoring Report, July 2008* (URS, 2009) evaluated risks to human health from exposure to SS017 groundwater. The evaluation concluded that based on groundwater results from 1998 to 2008, if groundwater were used as a drinking water source, estimated excess lifetime cancer risks are well within the NCP allowable risk range of one in ten thousand (10^{-4}) to less than one in one million (10^{-6}), with risks likely near the lower end of the risk range (10^{-6}). The evaluation also indicated that based on the 1998 to 2008 results, dieldrin concentrations had a downward trend.

The OU-6 Draft Final Amended Proposed Plan (Air Force Real Property Agency [AFRPA], 2011) was issued for the regulatory agencies review and comment which recommended implementing

groundwater monitoring and IC elements for SS017 and NFA was proposed for BPW6. The amended preferred alternative will address the residual dieldrin contamination in subsurface soil by requiring deed restrictions and a DEUR for management of soil below 4 meters which may be terminated subject to regulatory agency approval, if a site-specific risk evaluation establishes that there is no adverse risk to human health from subsurface soil. A Draft OU-6 ROD (URS, 2012b) was issued selecting remedies the proposed in the Draft Final Amended Proposed Plan (AFRPA, 2011). The Draft OU-6 ROD (URS, 2012b) was not finalized nor executed.

Subsequent to issuing the Draft Final Amended Proposed Plan (AFRPA, 2011), a Supplemental Risk Assessment (SRA) (AMEC, 2014c) was conducted to provide an updated risk characterization for Site SS017 to reflect chemical residuals subsequent to the removal action to evaluate if the potential for remaining residual dieldrin concentrations adversely impact groundwater, either in terms of groundwater quality or future risk. The SRA concluded that the cumulative site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-5}, and the noncarcinogen hazard is less than one, and NFA is warranted. Based on the 6 June 2014 letter, EPA disagrees with the SRA conclusions that unrestricted closure is justified for SS017.

Based on the conclusions of the SRA, a Draft Final Amended Proposed Plan (AFRPA, 2015) was issued to the EPA and ADEQ which proposed a selected remedy of NFA for SS017. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017 and do not agree that the residual risk posed by SS017 supports a finding that the site is ready for unrestricted use and unlimited exposure.

3.3.6.2 SS017, Base Production Well No. 6

BPW6 is located just east of South Sagewood Street, west of the former military working-dog training area in SS017. The well was unused and slated for abandonment during basewide well closure/abandonment activities in 1996 and 1997. During the well closure, an oil stain was noted on the concrete pad supporting the electrical equipment for the pump and on adjacent surface soil. The source of the oil was observed to be a pinhole in an oil-filled capacitor associated with the pump motor starter. Because name plate information from the capacitor listed the contents as PCB-containing oils, the capacitors were removed from the site, packaged in drums, and transported for disposal to Salesco, Inc. in Phoenix by a subcontractor. During the pump removal and well abandonment activities, the stained concrete was removed and segregated on plastic sheeting (IT, 2000c).

An investigation of the surface and shallow subsurface soil for PCB contamination in the vicinity of the stained soil and concrete pad was performed in 1997 and was immediately followed by removal of contaminated soil and concrete. Soil samples collected from the bottom of the excavation showed that PCB-contaminated soil remained at the surface and at 6 ft bgs (IT, 2000c).

The site was included in SS017 within OU-6 for further characterization of PCB contamination in surface and subsurface soil. During the OU-6 RI in 1998, 22 shallow soil borings across BPW6 were drilled and sampled to a maximum depth of 4 ft bgs, and one deep soil boring was drilled and sampled to a depth of 30 ft. Results documented the widespread presence of PCB-contaminated soil at the surface, and the absence of contamination in the source area at a depth of 11 ft bgs (IT, 2000c).

The OU-6 FS recommended soil excavation, backfill, and disposal as the preferred alternative for SS017 PCB-contaminated soil (IT, 2000c). The OU-6 Proposed Plan was issued for public review and comment on 3 March 1999. However, the associated Draft Final OU-6 ROD (IT, 2000b) was never finalized or signed.

The OU-6 Draft Final Amended Proposed Plan (AFRPA, 2011) was issued for the EPA and ADEQ review and comment which proposed NFA for BPW6. A Draft OU-6 ROD (URS, 2012b) was issued selecting remedies proposed in the Draft Final Amended Proposed Plan (AFRPA, 2011). The Draft OU-6 ROD (URS, 2012b) was not finalized nor executed.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

Remedies have been selected for every IRP site at the former Williams AFB, except for those sites in OU-6. Selected remedies for each OU and site addressed in the Five-Year Review are provided in this section.

4.1.1 OU-1 (LF004)

4.1.1.1 OU-1 ROD –Soil

Surface soil at LF004 was contaminated with dieldrin and beryllium at levels above RGs and groundwater contamination at LF004 was below action levels at the time the OU-1 ROD was approved. In April 1994, the OU-1 ROD (AFBCA, 1994) was finalized, which specified an RA for beryllium and dieldrin contamination in cover soil at the landfill. A remedy was selected in the signed April 1994 OU-1 ROD with its remedial action objective (RAO) to prevent human health and environmental exposure to contaminated soil.

Consensus Statement No. 03-01, which was signed on 24 September 2003 by the AF, EPA, and ADEQ, clarified the term "soil monitoring" to mean visual inspection of the soil cap integrity, not physical soil sampling (AF, 2003). The permeable cap and related components were installed in 1995.

Access controls imposed by the remedy include engineering controls (ECs), such as the perimeter fence and the posting of warning signs. ICs include land use restrictions to protect the integrity of the landfill cover and the implementation of a long-term groundwater monitoring program. Routine inspection and maintenance of the cap is included in the post-closure care (AFBCA, 1994).

4.1.1.2 OU-1 ROD Amendment –Soil Gas and Groundwater

The April 1994 OU-1 ROD did not select a soil gas and groundwater remedy for LF004 because, at the time, there were no identified soil gas or groundwater impacts that required RA. Post-closure groundwater monitoring at LF004 identified PCE and TCE at levels exceeding EPA MCLs. Subsequently, the AF conducted a supplemental RI to investigate contaminant sources and characterize the nature and extent of TCE and PCE in groundwater. Based on the findings of the Supplemental RI (URS, 2010), a FFS (AMEC, 2013a) was completed to evaluate remedial alternatives for soil gas and groundwater impacts at LF004. Subsequently, the Amended Proposed Plan for OU-1, LF004 (AF, 2013a) identified FFS Alternative 5, In-Well Air Stripping (IWAS), Oxidation and Soil Vapor Extraction as the preferred soil gas and groundwater alternative.

The OU-1 ROD Amendment was subsequently prepared to documents a change in the LF004 remedy in order to address TCE and PCE in soil gas and groundwater (AMEC, 2014a) by conducting IWAS, oxidation, and SVE. The ROD Amendment retained the remedy selection for soils specified in the April 1994 OU-1 ROD including permeable cap maintenance, ECs and ICs. The RAOs identified in the ROD Amendment at LF004 are: 1) prevent exposure to contaminants

in groundwater exceeding drinking water standards, 2) prevent exposure to contaminants in indoor air at concentrations exceeding the risk management range of $1x10^{-4}$ to $1x10^{-6}$ Incremental Lifetime Cancer Risk (ILCR) or a Hazard Index (HI) of greater than 1, and 3) restore the groundwater to drinking water and AWQS. The following sequenced processes are prescribed by the selected remedy in the OU-1 ROD Amendment to achieve the RAOs:

- Until cleanup levels are achieved, ICs will be implemented to prevent human exposure to contaminants in soil gas and groundwater. Controls will include restrictions that limit property uses, prohibit groundwater extraction or installation of groundwater wells other than for monitoring or remediation, and require that vapor intrusion risk be assessed and/or new structures be designed and built to mitigate unacceptable vapor intrusion risk.
- Initial IWAS wells will volatilize and extract contamination from the areas of highest PCE and TCE concentrations.
- Depending on effectiveness of the IWAS wells, supplementary oxidant injection wells or oxidant applied directly to the IWAS wells will treat contamination in place, reducing the required operation time of the IWAS wells and accelerating the time to achieve cleanup levels.
- System performance monitoring over the first few months of operation will confirm the performance and efficiency of the IWAS wells and will provide the design basis for subsequent system expansion. The extents of treatment areas requiring sequential phases of implementation are anticipated to be based on observed concentrations during initial phases of treatment.
- SVE wells will extract contamination from the former AST area and operate until it is demonstrated that the RAOs are achieved. Soil gas confirmation sampling results will be used to support the demonstration that RAOs are achieved.
- Additional IWAS wells will focus on areas where PCE and TCE exceed 20 µg/L in the remainder of the proposed treatment area. Groundwater sampling performed during new IWAS well installation, in combination with sampling results from the existing groundwater monitoring network, will delineate the areas to be treated during system expansion.
- Based on the observed progress of IWAS and oxidant technologies toward achieving cleanup levels, additional IWAS, oxidant technologies, or air-sparging may be implemented in areas of lower groundwater contamination (<20 µg/L) if attenuation by active remediation and natural attenuation processes is not proceeding as anticipated. Monitored natural attenuation may be used for certain areas of the site outside active treatment areas where cleanup levels are only slightly exceeded and concentrations will decrease as a result of mass removal in active treatment areas.
- Groundwater sampling and analysis will track the progress of the remedy effectiveness.

The OU-1 ROD Amendment states that the selected remedy for groundwater will be implemented until the chemical-specific cleanup levels are reached, expected to be within 10-15 years. Monitoring of the groundwater remedy will be conducted until cleanup levels have been reached and then continue in accordance with existing landfill post-closure monitoring requirements. In the absence of alternative mutual agreement between the AF, EPA and ADEQ, cleanup levels

will have been attained when monitoring results throughout the plume reach concentrations at or below the cleanup levels and remain below cleanup levels throughout a two year period of continued groundwater monitoring after cleanup levels were initially achieved. The AF, EPA and ADEQ may agree to termination of monitoring at specific locations or for the overall plume area based on a shorter duration or other criteria upon mutual agreement.

4.1.2 OU-2 (ST012)

OU-2 was defined as groundwater and shallow soil (1 to 25 ft bgs) contamination at the ST012 (Former Liquid Fuels Storage Area) in the OU-2 ROD (IT, 1992a), which was signed 30 December 1992. Deep soil at ST012 was originally investigated under OU-3 and subsequently was reincorporated into OU-2 in 1996 with the OU-2 ROD Amendment 1 (IT, 1996a). The OU-2 remedy for groundwater defined in the OU-2 ROD (IT, 1992a) was replaced by the OU-2 ROD Amendment 2 (AMEC, 2013b) selected remedy.

4.1.2.1 OU-2 ROD – Shallow Soil

Shallow soil was contaminated with benzene and 1,4-dichlorobenzene at concentrations above RGs. The numeric goals or acceptable levels, as stated in the OU-2 ROD, for shallow soil were 45 mg/kg and 55 mg/kg for benzene and 1,4-dichlorobenzene, respectively. The selected remedy in the OU-2 ROD is to clean up contaminated shallow soil to acceptable levels of contaminated soil in the top 25 ft by SVE.

4.1.2.2 OU-2 ROD Amendment 1 – Deep Soil

Deep soil (between 25 ft bgs and groundwater) was determined to be contaminated with benzene and TPH (defined by aviation fuels). The RAOs specified in the OU-2 ROD Amendment 1 were to reduce the time required for groundwater cleanup and to remove sources of JP-4 in deep soil that may continue to impact groundwater. The acceptable cleanup levels for deep soil were defined as being 5 mg/kg benzene and 2,000 mg/kg TPH. The selected remedy included a combination of SVE, bioventing, and natural attenuation.

4.1.2.3 OU-2 ROD Amendment 2 – Groundwater and NAPL

The OU-2 ROD Amendment 2 remedy for groundwater at ST012 is SEE and EBR. The remedy will achieve cleanup levels by combining SEE of groundwater and LNAPL with EBR of the remaining contaminant plume. The active components (SEE and EBR) of the selected remedy for groundwater will be implemented until the chemical-specific cleanup levels are reached, or analysis of biological and natural attenuation related degradation suggest that contaminants will naturally degrade to the desired concentration within an overall remedial timeframe of approximately 20 years. Monitoring of groundwater will continue until attainment of all cleanup levels has been demonstrated. Transition criteria for SEE to EBR and from EBR to monitoring are presented in the *Final Remedial Design and Remedial Action Work Plan* (AMEC, 2014d). The RAOs specified in the OU-2 ROD Amendment were 1) to prevent exposure to contaminants in water exceeding drinking water standards; 2) to prevent exposure to contaminants in water at concentrations exceeding $1x10^{-6}$ to 10^{-4} ILCR or an HI greater than 1 when a drinking water standard is not established; and 3) to restore the aquifer to drinking water and AWQS. The

acceptable cleanup levels for groundwater COCs defined in the OU-2 ROD Amendment 2 are 5 µg/L benzene, 1000 µg/L toluene, and 28 µg/L naphthalene. Existing ICs will prohibit extraction/pumping of groundwater or installation of new wells at the site for purposes other than remediation or monitoring until cleanup levels are achieved and the existing controls (deed restrictions and DEUR) are removed.

4.1.3 OU-3 (FT002)

The OU-3 ROD, addressing FT002, was signed 6 July 1996 (IT, 1996b). Soil at FT002 between 7 and 76 ft bgs is contaminated with benzene, chloroform, and 1,4-dichlorobenzene at levels that exceeded RAO of 1.4 mg/kg for benzene, 0.53 mg/kg for chloroform, and 7.4 mg/kg for 1,4-dichlorobenzene. A remedy was selected in the ROD to achieve RAOs in FT002 soil by bioventing. The Final OU-3 ROD required in situ treatment via bioventing of soil contaminated with benzene, chloroform, and 1,4-chlorobenzene.

4.1.4 OU-4 (SS016, SS019, SS020, SS021, and SS024)

The selected remedies for these sites are summarized as follows:

- *SS016. Electroplating/Chemical Cleaning Shop, Building 1085.* Establish ICs in the form of deed restrictions and the placement of a VEMUR to restrict the site to non-residential use in the future.
- *SS019. Former Skeet Range at South Desert Village.* Removal of affected surface soil, and installation of a protective cap, followed by ICs (a VEMUR), and compliance with an approved O&M manual. Human habitation of SS019 is allowed in accordance with the ROD, VEMUR, O&M Manual, the Quit Claim Deed between the U.S. Department of Education and ASU, and the Agreement between ADEQ and ASU.
- *SS020. Firing Range/Skeet Range.* Removal of affected surface soil (Firing Range only) and ICs in the form of deed restrictions and VEMUR to restrict the site to non-residential use in the future.
- *SS021. Facilities 1020/1051.* Establish ICs in the form of deed restrictions and the placement of a VEMUR to restrict the site to non-residential use in the future.
- *SS024. Building 1010 - Entomology.* Establish ICs in the form of deed restrictions and the placement of a VEMUR to restrict the site to non-residential use in the future.

4.1.5 OU-5 (DP028)

DP028, which is located adjacent to LF004, was addressed as part of LF004, as indicated in the *Final Explanation of Significant Differences for the OU-1 Record of Decision* (AF, 1995). Accordingly, the OU-5 ROD did not specify any further actions to be implemented (IT, 1997a).

4.1.6 OU-6 (SS017)

Remedy selection has not been completed for OU-6.

4.2 Remedy Implementation

All remedies for the former Williams AFB are in place or in planning. The status of remedy implementation to date is presented here by OU.

4.2.1 OU-1 (LF004)

The remedial design for the permeable landfill cap at LF004 started in October 1994 and ended in February 1995. The RA was completed between February 1995 and July 1995. Annual cap monitoring and semiannual groundwater monitoring has been ongoing at LF004 since completion of the RA, and limited repairs and maintenance have been needed (as documented in the Annual Landfill Cover Inspection reports).

Post-closure groundwater monitoring at LF004 has consistently detected VOCs (PCE and TCE) at concentrations above the AWQS/MCL. PCE was first detected in groundwater samples at concentrations exceeding the AWQS/MCL of 5 μg/L in July 1995. TCE began to be detected at concentrations above the AWQS/MCL of 5 μg/L in September 1997.

The Follow-On RI was performed in 2000 to investigate the apparent spike in PCE and TCE discovered in some landfill groundwater wells. The Follow-On RI focused on VOCs in soil gas to 25 ft bgs and included the installation of additional groundwater monitoring wells. No obvious source area was determined from the shallow soil gas data. However, relatively high levels (thousands of parts per million by volume) of TCE and PCE were found in shallow soil gas (HGL, 2003b).

In 2004, the AF drafted a detailed CSM for the LF004 site which was finalized in January 2006 (BEM, 2006).

Beginning in 2007, the AF conducted a Supplemental RI at LF004 to determine if shallow point sources in soil exist that may be contributing to the elevated PCE and TCE observed in groundwater, which included revisions to the CSM (URS, 2010). Consistent with the revised CSM, the investigation identified a source area northeast of the landfill where groundwater is rising into historical contaminants sorbed to soil in the vadose zone, and appears to be mobilizing them into groundwater. Another area in the southeast portion of the landfill was also identified that could potentially be a source area; however, detections in soil gas were an order of magnitude lower than detections observed northeast of the landfill.

In March 2013, treatment areas and conceptual designs for LF004 groundwater and soil gas were developed in the *Final Focused Feasibility Study for Remedial Alternatives at LF004* (AMEC, 2013a). The FFS evaluated five remediation alternatives for LF004. In March 2014, a ROD Amendment was finalized specifying the preferred alternative presented in the Amended Proposed Plan (AF, 2013a), Alternative 5: In-Well Air Stripping (IWAS), Oxidation, and Soil Vapor Extraction as the LF004 groundwater and soil gas remedy.

The *Final LF004 Pre-Design Investigation Work Plan* describes supplemental activities to support preparation of the remedial design for LF004 (AMEC, 2013c). During the period 03 through

21 June 2013, two remediation wells and eight piezometers were installed at LF004 as part of the Pre-Design Investigation (PDI). The remediation wells were installed in the highest concentration areas of the PCE and TCE contaminant plumes near monitoring well LF01-W17 and monitoring well LF01-W19 (AMEC, 2013c). On 14 and 29 October 2013, remediation wells LF01-RW01 and LF01-RW02 were placed into continuous operation, respectively, to evaluate IWAS prior to developing the remedial design for the site. Monthly performance monitoring, which included monthly collection of groundwater samples from the aforementioned two remediation wells, eight piezometers, and six monitoring wells, was performed until shutdown of LF01-RW01 and LF01-RW02 on 28 February 2014 and 10 January 2014, respectively.

The chemical oxidation portion of the PDI started in March 2014, when sodium permanganate was mixed into water extracted from monitoring well LF01-W19M and reinjected into remediation well LF01-RW02 (both recirculated and batch oxidant injection were conducted). In total, approximately 380 gallons of 40 percent (%) (by weight) sodium permanganate solution was injected into LF01-RW02. Recirculated oxidant injection occurred on 04 March 2014 for four hours. Batch oxidant injection occurred intermittently from 24 through 27 March 2014. PDI test results are presented with a plan for full-scale operation of the LF004 in the *Final Remedial Design and Remedial Action Work Plan* (AMEC, 2014e).

The *Construction Completion/Startup Report for Operable Unit 1 Groundwater and Soil Gas Remedies* documents installation of the LF004 ROD Amendment remedy (AMEC, 2015a). Operation, maintenance, and monitoring (OM&M) of LF004 groundwater and soil gas treatment systems began on 29 August 2014 and continues to date. Review of treatment system performance is conducted on a routine basis in Quarterly Status Reports prepared for the site.

4.2.2 OU-2 (ST012)

4.2.2.1 OU-2 ROD Remedial Actions (1991 - 1997)

Once the OU-2 ROD was signed, the shallow soil design and clean up was initiated. The groundwater remedial design, however, was preceded by a series of studies to determine and enhance the effectiveness of groundwater withdrawal and treatment. These studies evaluated the effectiveness of groundwater extraction using vertical and horizontal wells. Ultimately, the studies determined groundwater remediation was impractical by the pump and treat methods specified in the OU-2 selected remedy. Free product (i.e., LNAPL) recovery was initiated to reduce the LNAPL source. Finally, the ST012 deep soil investigation under OU-3 was conducted. The results of this investigation led to the amendment of the OU-2 ROD, which reincorporated deep soil into OU-2.

4.2.2.1.1 Shallow Soil Remedial Action

Implementation of the selected remedy OU-2 ROD for shallow soil remediation at ST012 began in 1993 with an initial pilot study. Earth Tech prepared plans for site SVE and bioremediation, and conducted site assessments and soil-gas investigations to assist in location of a pilot study site.

The remedy at ST012 was implemented at Facilities 538 and 514. Based on data collected during previous soil gas surveys, a pilot SVE test was performed at the former UST Facility 538 in 1994; results verified the soil at ST012 could be successfully remediated using SVE. There was also

measurable bioactivity (Earth Tech, 1995). Following this test, a site-wide soil gas survey was performed, which identified five localized areas with elevated BTEX concentrations. Soil sampling in these five areas documented concentrations of BTEX above OU-2 ROD cleanup levels at the former UST Facility 514. Design parameters for a full-scale SVE system were developed, and SVE was operated at Facility 514 during 1995 and 1996 until sampling verified compliance with site cleanup goals.

Continuous operation of the SVE system during the pilot study at Facility 538 documented a rapid decline of soil gas concentrations of BTEX and total volatile hydrocarbons (TVH) over the first four to five months of operation. Extended operation over the next three to four months produced only minor reductions, and it was concluded that this vapor was being extracted from deeper soil (Earth Tech, 1995). An estimated 40,702 pounds (lbs) of TVH (7,362 gallons of hydrocarbons [as N-hexane]) were extracted during the pilot study (Earth Tech, 1995). Calculations in Appendix A of the Final FFS (AMEC, 2012a) presents an estimate that includes all Earth Tech removal data for Facility 538, and totals 52,200 lbs of TVH (8,030 of gallons hydrocarbons [as JP-4]). After SVE operation began at Facility 514, there were decreases of BTEX and TVH over the period of six months. Appendix A of the Final FFS (AMEC, 2012a) presents an estimate using Earth Tech data of 24,200 lbs of removed TVH (3,730 gallons of hydrocarbons [as JP-4]). Shallow soil sampling and analysis performed at both Facility 538 and Facility 514 after SVE shutdown verified cleanup to levels specified in the OU-2 ROD had been met (Earth Tech, 1996).

4.2.2.1.2 Groundwater Remedial Action Studies

Implementation of the studies to verify the optimum design for groundwater remediation at ST012 began with a demonstration conceptual design (DCD) (CDM, 1992). The DCD resulted in a pilot study/demonstration study (PS/DS), which involved: 1) the design, construction, and operation of groundwater extraction systems; 2) a monitoring system to assess the groundwater depression caused by the extraction systems; 3) a treatment system to remove dissolved contaminants from extracted groundwater; and 4) a reinjection system for discharge of treated groundwater. The purpose of the PS/DS was to compare the effectiveness of horizontal and vertical well recovery of LNAPL and contaminated groundwater. During the PS/DS, which was summarized in a PS/DS report (CDM, 1995), two horizontal and two vertical extraction wells and four injection wells were installed. The PS/DS included pump testing of the horizontal and vertical extraction wells, and infiltration testing of the injection wells. Two deep horizontal extraction wells were installed and developed at ST012. Pump tests performed on these wells documented a sustained pumping rate for HW-1 of 28 gallons per minute (gpm), measureable drawdown in a nearby vertical recovery well, and a strong vertical to horizontal flow anisotropy. HW-2 produced a sustained pumping rate of 2.5 gpm and was characterized as a low-yield well. Two vertical extraction wells were installed and developed; they produced sustained pumping rates of 2 to 4 gpm. The conclusions of the PS/DS report (CDM, 1995) were as follows: 1) strong aquifer anisotrophy and rising groundwater rendered horizontal wells ineffective for hydraulic control; 2) the contaminated aquifer is a low-yield aquifer; 3) successful groundwater remediation is technically impractical by pump and treatment methods using the design and methods set forth in the DCD and the OU-2 ROD. Further construction of an extraction and fluid treatment system was halted in 1995.

4.2.2.1.3 Free Product (LNAPL) Recovery

Free product (i.e., LNAPL) recovery began in August of 1990 with the installation of a dedicated skimmer pump recovery system, which was operated until 1996. Over this period, the LNAPL recovery rates declined from as much as 80% LNAPL to almost no LNAPL, so a decision was made to use a portable recovery system. The portable system was operated for 10 months on a monthly basis. Over the course of the recovery efforts, a total of 10,564 gallons of LNAPL and about 20,000 gallons of contaminated groundwater were removed.

4.2.2.2 OU-2 ROD Amendment 1 Remedial Actions (1995-2011)

During this period, pilot and treatability studies for SVE and bioventing were performed to determine the effectiveness of the remedies specified for the deep soil at ST012. Following the pilot study, SVE was implemented to remediate the deep soil. Groundwater compliance monitoring continued with the addition of analytical parameters to document natural attenuation in the ST012 groundwater. Initiatives were begun to determine the origin of the LNAPL, and determine if there was an effective way to withdraw LNAPL from wells. Upon the decision that groundwater extraction and treatment was not a viable technology for ST012, a pilot test for TEE was performed in a limited area of ST012.

4.2.2.2.1 Deep Soil Pilot / Treatability Studies

To evaluate deep soil cleanup technologies, various pilot studies were planned and initiated in 1996. Battelle performed limited SVE testing as part of free product recovery study in 1996 (Battelle, 1997). BEM installed dual-phase extraction (DPE) well DPE-1 and four monitoring points as part of a treatability study in support of monitored natural attenuation. An SVE treatability study was performed by BEM and Parsons Engineering Science, Inc. (Parsons) with thermal oxidation treatment of extracted vapor in 1996. Another technology demonstration was performed by BEM and Parsons in 1997 using SVE with internal combustion engine (ICE) treatment of extracted vapors. The actions and results of the deep soil SVE study are documented in a technical report (Battelle, 1997), and summarized in the *Final Consolidated Treatability Study and Remedial Action Decision Report* (BEM, 1998a) for ST012. Results indicated that deep-soil SVE was capable of rapid and significant source removal at ST012, and that ICE was more efficient as a vapor destruction method for high influent concentrations than was thermal oxidation treatment. More than 20,000 equivalent gallons of fuel hydrocarbons were recovered in vapor form during the SVE/ICE demonstration, for an average rate of 480 gallons per day.

In 1996, BEM (BEM, 1998a) and Parsons (Parsons, 1997) performed a bioventing pilot study to determine: 1) the potential for supplying oxygen throughout the contaminated deep soil zone; 2) site-specific biodegradation rates; and 3) design parameters and cost estimates for a full-scale bioventing system using the DPE well and monitoring point locations installed for deep soil SVE studies. In addition, Battelle performed in-situ respiration testing for bioventing parameters in 1996 (Battelle, 1997). The bioventing test indicated that oxygen has been depleted by fuel biodegradation in contaminated deep soil. Air injection is typically an effective method of increasing aerobic biodegradation of fuel contamination; however, results showed a low biodegradation rate for the contaminated soil, which would make bioventing ineffective and inefficient. Continuous air injection has been observed to increase biodegradation rates, but a

year-long bioventing study at Site FT002 of the former Williams AFB did not demonstrate increasing biodegradation rates. The similarity of ST012 to FT002 suggests that biodegradation rates would not increase over time at ST012.

4.2.2.2.2 Deep Soil SVE Remedial Action

Because of the demonstrated efficiency of the SVE/ICE system, deep soil SVE to facilitate source removal was continued at ST012 at the completion of the treatability study. An additional DPE well was constructed with two nested well completions screened to remediate different zones of contaminated deep soil and monitoring points were installed at eight depths at three locations. A second SVE/ICE unit was brought on line in April 1997. The two systems were operated August 1998, when the second ICE unit became nonfunctional. During January and February 1999, both units were upgraded and reinstalled, and in operation until April 1999. The units were removed and stored from April 1999 to July 1999, then re-installed and operated until July of 2003. Between the start-up of the SVE/ICE system in February 1997 and its closure in 2003, an estimated total of 343,000 gallons of hydrocarbons had been removed and destroyed by the ICE units (BEM, 2004), equivalent to about 2,230,000 lbs.

The SVE/ICE system did not reach the requirements specified by the OU-2 ROD Amendment 1, so BEM began the installation of a full-scale SVE system in 2003 (BEM, 2003; 2004). Up to 27 wells were available for use in the operation of the SVE system, although typically only select wells were operated in order to optimize system performance. Between the start-up of the SVE/ICE system in April 2005 and December 2011, an estimated total of 252,000 gallons of hydrocarbons had been removed and destroyed by the flame and thermal oxidizer units, equivalent to about 1,637,000 lbs. Deep soil hydrocarbon contaminant removal by SVE was continued as a part of ongoing RAs prudent to the OU-2 ROD Amendment 2.

4.2.2.2.3 Groundwater Compliance Monitoring

Following groundwater characterization sampling from August 1989 to October 1991, groundwater compliance monitoring at ST012 was initiated on a quarterly basis in 1992. Monitoring continued quarterly through 1993, when it was decreased to semiannually through 1996. Monitoring has been performed annually since that date. The objective of groundwater compliance monitoring is to track the behavior of the BTEX-contaminated groundwater plume beneath ST012 and assure it is contained. The monitoring well network was designed to allow the collection of an annual "snapshot" of ST012, and facilitate the comparison with previous sampling events and the progress toward remediation. Two additional events per year were added during the TEE Pilot Test. These additional events were targeted at monitoring for potential changes in the contaminant migration from the TEE Pilot Test.

4.2.2.2.4 LNAPL Recovery Study

The AFCEC bioslurper initiative was designed to develop procedures for evaluating the potential for recovery of free-phase LNAPL at petroleum-contaminated sites within the IRP. The objective at ST012, as at similar sites nationwide, was to evaluate applicability, cost, and performance of bioslurping as a technology for removal of LNAPL, and to identify site parameters that are reliable predictors of successful LNAPL recovery and site remediation. A bioslurping study was performed

at ST012 by Battelle in 1996, and summarized in a report (Battelle, 1997). Site characterization activities, such as baildown testing of LNAPL mobility, were performed first. Pilot tests for skimmer pumping, bioslurping, and SVE were then conducted, using various configurations of drop tube diameters, pump types, and pump vacuums. Measurements of extracted soil gas composition, LNAPL thickness, and groundwater level were collected throughout the testing. Bioslurping testing at ST012 demonstrated the ability of liquid-ring pumps to extract liquids from depths exceeding 200 ft, but LNAPL recovery was low relative to groundwater extraction totals (Battelle, 1997). Tests on both wells produced similar results, and drop tube diameter was observed to have little effect on LNAPL recovery. The initiative was, therefore, abandoned.

4.2.2.2.5 Thermal Enhanced Extraction Pilot Test

A pilot test to evaluate the use of TEE as a source reduction technology for ST012 was performed between 2004 and 2010 by BEM. The TEE Pilot Test is documented in the Pilot Test Work Plan (BEM, 2007), the Construction Completion/Inspection Report (BEM, 2010), and the Pilot Test Performance Evaluation Report (BEM, 2011). The pilot test was conducted within a single treatment cell having a diameter of 140 ft. The cell contained a single central injection well pair surrounded by six perimeter extraction well pairs. The TEE Pilot Test cell contained six monitoring well locations within the cell interior and an existing overlying vadose zone SVE well nest completed within the cell.

Effectiveness of the TEE Pilot Test was judged based on mass removal as determined by process samples of extracted fluids and gasses and mass reduction based on comparison of the pre- and post-test soil and groundwater sample analytical results. Concentrations of benzene and lighter hydrocarbon chain COCs were reduced in post-test soil samples (BEM, 2011) and concentrations of all COCs in groundwater were measurably reduced, with greater reduction nearer to the injection wells (BEM, 2011).

Extracted fluids and vapors were analyzed for contaminant concentration and the results were used to generate an estimate of mass removal on a contaminant by contaminant basis. Roughly 118,000 lbs of petroleum hydrocarbons was extracted and estimated total of 4,000 lbs of benzene was removed during the pilot test. The AF concluded that the TEE technology represents a potentially applicable technology for contaminant mass removal at ST012.

4.2.2.3 OU-2 ROD Amendment 2 Remedial Actions (2011-Present)

During this period, groundwater containment activities following the TEE Pilot Test were suspended until execution OU-2 ROD Amendment 2 was signed, and the SEE system operations were initiated. SEE system operations are currently being conducted to achieve the RAOs established by the OU-2 ROD Amendment 2. Groundwater monitoring and deep SVE have continued since the previous period.

4.2.2.3.1 Groundwater Containment

Subsequent to the TEE Pilot Test, TEE system components were modified into a groundwater extraction and treatment system to implement an interim groundwater RA at the site while the AF evaluates a long-term site remedy. The objectives of the redesigned system were to provide an

element of hydraulic containment within the ST012 source area and remove benzene mass utilizing the best functioning components of the TEE system for groundwater extraction and treatment (AFRPA, 2010). Operation of the ST012 Groundwater Containment System occurred on an intermittent basis in October 2011, and continuous operations began in January 2012 in the ST012 source area. Throughout containment operations, the groundwater extraction flow rate ranged between 20 gpm to 45 gpm based on operability of individual wells, changes in process pressures (due to filter fouling) and conditions which shut down operations. ST012 Groundwater Containment System was suspended at the beginning of August 2013 in advance of implementing the long-term groundwater RA at the site (the SEE System) pursuant to the OU-2 ROD Amendment 2 (AMEC, 2014f).

4.2.2.3.2 Steam Enhanced Extraction

Full scale OM&M of the SEE system began 29 September 2014. The SEE system is operated by Amec Foster Wheeler's subcontractor TerraTherm, Inc. The criteria for evaluation of transition from SEE to EBR are detailed in the *Final Remedial Design and Remedial Action Work Plan* (AMEC, 2014d) and include: subsurface temperatures; completion of pressure cycling; diminishing mass removal rates; and benzene concentrations. The SEE treatment processes and effectiveness are documented in the quarterly performance reporting. The system is comprised of 31 steam injection wells, 55 multi-phase extraction wells and two dual (extraction and injection) wells. During the initial months of operation, steam was injected into 15 lower saturated zone wells and seven upper water bearing zone wells. Subsequently, operational changes of available injection and extraction wells are implemented to optimize hydrocarbon removal. Since startup of the SEE system, the total mass removed as vapor and recovered LNAPL was 1,700,609 lbs of TPH as determined by analytical sampling (Amec Foster Wheeler, 2015a).

4.2.2.3.3 Deep Soil SVE Remedial Action

Seven deep screened interval SVE wells within the SEE thermal treatment zone were shut off and disconnected from the SVE system on 18 August 2014 and will remain disconnected during SEE. The shallow and middle screened interval SVE wells will continue to be connected to the SVE system and the single screen intervals for the five new SVE wells. Up to 25 wells are available for use in the operation of the SVE system, although typically only select wells are operated in order to optimize system performance. Cumulatively, an estimated 1,982,000 lbs (301,500 gallons) of TPH as JP-4 have been removed and treated by the ST012 deep vadose zone SVE system from April 2005 through September 2015 (Amec Foster Wheeler, 2015a). Deep soil hydrocarbon contaminant removal by SVE is ongoing as a part of SEE.

4.2.2.3.4 Groundwater Compliance Monitoring

Groundwater monitoring is currently conducted annually in accordance with the OU-2 ROD Amendment 2 (AMEC, 2014f). Annual groundwater monitoring including groundwater analytical sampling, water level measurements and LNAPL thickness measurements from all accessible wells was conducted during this period. Since 2013, annual groundwater monitoring has been conducted in accordance with the Final Groundwater Monitoring Work Plan (AMEC, 2013f). Results to date indicate the presence of a plume of contaminated groundwater, indicated primarily by benzene, with varying amounts of LNAPL present in the core of the plume.

4.2.3 OU-3 (FT002)

A removal action at FT002 was conducted in 1994 and consisted of the following (Halliburton NUS Corporation, 1994):

- Removal and disposal of fluid from the two pits and associated piping;
- Removal and disposal of two ASTs, both fire pits, and associated structures, valves, sumps, pumps, etc.;
- Excavation and disposal of piping;
- Excavation and removal of VOC and TPH contaminated soil at both burn pits down to a maximum of 5.5 ft bgs; and
- Placement of a vapor barrier and clean backfill into each fire pit excavation.

A Characterization Confirmation Investigation of the two burn pits at FT002 was conducted in 1995, in support of a year-long bioventing treatability study around the time of the soil excavations to a depth of 5.5 ft bgs at the burn pits. Beneath the eastern burn pit, soil contaminants such as BTEX, 1,4-dichloroethane, and chloroform were documented from 7 ft bgs to a maximum depth of about 135 ft bgs. Soil beneath the western burn pit was documented to be uncontaminated. Subsurface soil gas probes were installed around the burn pits and sampled to confirm the soil sampling results (BEM, 1997a).

A bioventing treatability study was conducted at FT002 from August 1995 to August 1996. Results of the study documented a very slow rate of contaminant biodegradation at FT002 (BEM, 1997a). An SVE treatability study was conducted at FT002 in July and August 1997 (BEM, 1997b). Results of the study documented removal of relatively low levels of volatile soil gas and concluded SVE was ineffective at FT002 (BEM, 1998b).

Because of the demonstrated slow rate of remediation using the selected remedy, a site receptor evaluation was performed in 1998 under newly promulgated Arizona risk-based soil cleanup levels to determine if a potential threat to human health and the environment existed from residual chemicals in the subsurface soil. Both non-residential risk evaluation and Arizona groundwater protection modeling were performed, with results that documented no threat to human health and the environment under current non-residential use (BEM, 1998b). In June 2006, the Base Realignment and Closure (BRAC) Cleanup Team (BCT) agreed that no further RAs were needed at FT002 if ICs could be used to prevent future residential use of the site. In April 2008, a DEUR was executed that provided this land use restriction (AF, 2008).

Based on technology limitations and the current site use of FT002, and because OU-3 ROD (IT, 1996b) cleanup levels were not achieved, the AF, EPA, and ADEQ agreed to reevaluate the remedy. An additional Site Closure Investigation was conducted in 2012 and 2013 at the eastern and western burn pits to update site conditions and provide supplemental information for risk evaluation at Site FT002 (AMEC, 2014b). From December 2012 to June 2013, soil and soil gas samples were collected to evaluate current FT002 subsurface conditions in accordance with the Final FT002 Work Plan for Site Closure (AMEC, 2012b, 2013i, 2013g). The results of the soil and soil gas sampling indicated that the VOCs, BTEX, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB

are present in the subsurface soils at levels that prevent closure to unrestricted uses. PAHs were not detected in soil samples at levels exceeding the laboratory reporting limits. Perfluorinated compounds concentrations did not exceed established Air Force risk-based soil screening levels (AF, 2012) and perfluorooctane sulfonate concentrations in the soil samples collected at the Eastern Burn Pit and Western Burn Pit are less than the minimum GPL (AMEC ,2014b).

Based on the results of the soil and soil gas sampling, remediation is required to achieve the soil cleanup objective. Alternative FT02-4: SVE, originally determined to be a protective and viable remedy from the OU-3 ROD (IT, 1996b), was subsequently selected as the remedial approach to achieve the RAOs. The rationale for the design, installation, startup, and operation of the SVE system is detailed in the Final Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) Work Plan (AMEC, 2014b). SVE system installation was completed on 27 May 2014. The design, installation, and startup of the SVE system are documented in detail in the Final Remediation Construction Completion and Startup Report, (AMEC, 2015b). One nested SVE well and two vapor monitoring points were installed as part of the SVE remedy. The SVE system was started in thermal oxidizer mode on 02 June 2014. Due to the low influent TPH concentrations, the thermal oxidizer required supplemental propane to maintain temperature and required destruction efficiency. Treatment of extracted vapors was switched to electric catalytic oxidizer on 19 June 2014, with vapors extracted (AMEC, 2015b). The SVE system was shut down on 15 June 2015 to implement the rebound testing period.

In August 2015, five confirmatory soil borings were drilled and soil gas and soil samples were collected as a part of confirmation sampling at the eastern burn pit. Based on the confirmatory soil sample analytical results, the OU-3 ROD cleanup levels and Arizona Residential SRLs have been achieved for shallow soil with the exception of 1,2,4-TMB and 1,3,5-TMB. 1,2,4-TMB and 1,3,5-TMB were not considered as COCs or COPCs as part of the OU-3 ROD (IT, 1996b). A field variance specified removal of the residual 1,2,4-TMB and 1,3,5-TMB from the surface soil is expected to decrease the 1,2,4-TMB concentrations in VMP-2 (Amec Foster Wheeler, 2015b). Two excavations were conducted to remove 1,2,4-TMB and 1,3,5-TMB contaminated soil in November 2015 and January 2016. The AF is currently drafting a closure report based on the final results of confirmatory soil and soil gas sampling following the excavations which is expected to be finalized in September 2016.

4.2.4 OU-4 (SS016, SS019, SS020, SS021, and SS024)

The RAs performed are discussed separately for each of these sites.

4.2.4.1 Electroplating/Chemical Cleaning Shop, Building 1085 (SS016)

The VEMUR for SS016 was included in the OU-4 ROD, but not implemented at that time. The property was leased to the airport and used for non-residential purposes. A DEUR (current equivalent of a VEMUR) was recorded on 16 January 2009 concurrent with transfer of the property to the PMGAA.

4.2.4.2 Former Skeet Range at South Desert Village (SS019)

An RA at SS019 in the form of excavation, removal, disposal, and replacement of the top 6 inches of soil within the affected area was conducted in 1998 (HGL, 2000). An O&M manual to specify actions and procedures for protection of the protective soil cap in the South Desert Village was finalized in May 1999 (IT, 1999a). The required semiannual protective soil cap inspections began upon transfer of the property ownership from AF to ASU in 2001. Between the completion of the RA and the transfer of the property, ASU had served as surrogate caretaker of the soil cap, performing periodic informal inspections and apprising the AF of site conditions.

Most of the removed soil from SS019 (approximately 8,116 tons) was transported to a licensed landfill for disposal. Certain portions of soil were found through testing to contain lead above non-hazardous levels; approximately 2,038 tons were transported to the SS020 site for lead separation.

SS019 was transferred to ASU in 2001. Deed restrictions pertaining to SS019, the VEMUR, and the ASU-ADEQ O&M agreement concerning the South Desert Village protective soil cap, were all included in the deed.

4.2.4.3 Firing Range/Skeet Range (SS020)

Firing Range. An RA in the form of excavation, removal, and disposal was conducted at the SS020 Firing Range in 1998, and clean closure was documented (HGL, 2000; 2003a). Approximately 693 tons of soil removed from the backstop at SS020 was transported to a licensed landfill for disposal; 762 tons were subjected to lead separation. Soil from SS019 and SS020 was combined in the separation process. A total of 2,300 tons of soil from the separation process tested below 200 mg/kg total lead and was placed into the Firing Range backstop. The separation fraction that contained lead fragments and pellets were treated with trisodium phosphate and cement to stabilize the lead. Approximately 708 tons of stabilized soil (including soil processed from both SS019 and SS020) remained on-site at the Firing Range upon the completion of the RA in 1998. This soil was transported to a licensed landfill for disposal in March 2000. The DEUR for the Firing Range property was recorded on 15 September 2008.

Skeet Range. No RAs were required other than deed restrictions and a VEMUR/DEUR. The SS020 property was transferred to PMGAA in November 2008 with deed restrictions that prohibit use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years or age, or day care centers for children. The property is located at the end of a runway and has limited potential human exposures. A DEUR limiting SS020 Skeet Range area to non-residential use was recorded on 24 October 2012.

4.2.4.4 Facilities 1020/1051 (SS021)

In September 2007, the SS021 property was transferred to PMGAA with deed restrictions that prohibit use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years or age, or day care centers for children. A DEUR limiting SS021 to non-residential use was recorded on 20 September 2007.

4.2.4.5 Building 1010 (SS024)

SS024 was transferred to the City of Mesa in 1999 (pre-ROD), but is unoccupied and not used for residential purposes. The overall property including SS024 is fenced and access is controlled. A specific restriction limiting SS024 to non-residential use was not included in the deed. SS024 was intended to be excluded from the deed, but the legal description for the excluded area did not include the site area. As discussed in the OU-4 ROD, the conveyance of the property was for the sole purpose of carrying out a specific program (water and wastewater systems, a non-residential use). Subsequently, AF has coordinated with the City of Mesa to amend the deed which prohibits use of the property for residential purposes. A DEUR limiting SS024 to non-residential use was recorded on 14 April 2015.

4.2.5 OU-5 (DP028)

Site DP028 was included as part of the remedy for LF004 and this action was documented as part of the OU-1 ESD (AF, 1995).

4.2.6 OU-6 (SS017)

The AF implemented a removal action at SS017 in 2001 to reduce the potential risk associated with PCBs and dieldrin in shallow soil. The action memorandum (BEM, 2000) for SS017 contained design details for implementation of excavation, removal, and bioremediation/ disposal of contaminated soil, consistent with preferred alternative identified in the OU-6 FS (IT, 2000c) and Proposed Plan (AFBCA, 2000) although a ROD was never finalized. The AF executed a soil removal action in 2001 that resulted in the removal of soil at BPW6 contaminated with PCBs to levels below the Arizona SRL of 2.5 mg/kg and off-site disposal of the PCB contaminated soil; the removal of soil contaminated with dieldrin either to levels below the Arizona SRL of 0.28 mg/kg (established at the time of the excavation) or to a maximum depth of 4 meters (approximately 13 ft); and the stockpiling of the soil removed from SS017 at the TTF for future biological treatment. Both of the sites were backfilled with clean soil to grade. On-site treatment of the excavated soils at the TTF did not achieve treatment goals; therefore, the soil was disposed at a permitted RCRA Subtitle D landfill as non-hazardous waste in 2007. Old Pesticide/Paint Shop and BPW6 excavation activities are documented in a Revised Final OU-6 RACR (URS, 2013).

In 2001, the AF initiated quarterly groundwater monitoring of the four groundwater monitoring wells. Dieldrin concentrations were relatively stable with many results being non-detections. Accordingly, in 2004, the monitoring frequency was reduced to annual and continues to date.

4.3 System Operations/O&M

System O&M requirements are in place for OU-1, OU2, OU3 and OU-4. OU-5 has no requirements for system O&M. Annual groundwater monitoring is being performed at OU-6 until groundwater monitoring requirements are established in the finalized OU-6 ROD.

4.3.1 OU-1

O&M requirements are being implemented in accordance with the OU-1 ROD (AFBCA, 1994), OU-1 ROD Amendment –Site LF004 (AMEC, 2014a) and Consensus Statement No. 03-1 (AF, 2003).

Annual landfill cap inspections and maintenance are performed in accordance with the requirements of the *Operations and Maintenance Program, Installation of Permeable Cap, Landfill LF004* (IT, 1995c) and are documented in annual cap inspection reports. The *Final Annual Landfill Inspection and Maintenance Report, September and October 2014 Events* (Amec Foster Wheeler, 2015c) documents the most recent inspection performed in September 2014 and subsequent maintenance activities.

IWAS and SVE system sampling and maintenance are performed in accordance with the requirements of the *Remedial Design/Remedial Action Work Plan* (AMEC, 2014e) and the *Construction Completion/Startup Report OM&M* (AMEC, 2015a) and are documented in RA quarterly status reports. The most recent finalized quarterly status report presents treatment system OM&M and groundwater monitoring activities conducted from startup of the RA through 31 December 2014 (the reporting period (Amec Foster Wheeler, 2015d).

Semi-annual groundwater monitoring has been performed at LF004 from 1986 until the present, and is reported in groundwater monitoring reports. Current groundwater monitoring performed at LF004 is conducted per the *Final Groundwater Monitoring Work Plan – Site LF004* (AMEC, 2013d). Groundwater monitoring results are documented in semiannual reports. The most recent finalized semiannual groundwater report, which also summarizes results from previous events, is available for the May 2014 event (Amec Foster Wheeler, 2015e).

4.3.2 OU-2

O&M requirements are being implemented in accordance with the OU-2 ROD Amendment 1 (IT, 1996a) and OU-2 ROD Amendment 2 (AMEC, 2013b).

The operation of the SVE and SEE system, associated field and analytical procedures/protocols, and required monitoring for the OM&M activities are performed in accordance with the *Remedial Design and Remedial Action Work Plan for Operable Unit 2* (AMEC, 2014d), *Remedial Design and Remedial Action Work Plan for Operable Unit 2 Addendum #1* (AMEC, 2014g), *ST012 SVE OM&M* (AMEC, 2013h), *Revision #2 to ST012 SVE OM&M Manual – Post SEE Installation* (Amec Foster Wheeler, 2015f) and the *Operations and Maintenance Manual for SEE Treatment at the Former Williams Air Force Base ST012 (SEE OM&M Manual)* (included as Appendix D to the Construction Completion and Startup Report; AMEC, 2015c). The most recent status report presents SEE and SVE OM&M activities conducted from startup of the RA through 30 September 2015 reporting period (Amec Foster Wheeler, 2015a).

Groundwater monitoring and LNAPL removal is ongoing. Groundwater monitoring at ST012 is currently being performed in accordance with the ST012 Groundwater Monitoring Work Plan

(AMEC, 2013f). A groundwater monitoring report is developed for each event, the most recent documents the November 2014 event (Amec Foster Wheeler, 2016a).

4.3.3 OU-3

The FT002 SVE system remedial design, installation, operation, and monitoring was performed in general accordance with the Final UFP-QAPP (AMEC, 2014b). SVE system O&M is documented in two periodic O&M reports (Amec Foster Wheeler, 2016b; 2016c). Soil excavations were performed in accordance with the *Field Variance Memorandum #2* (Amec Foster Wheeler, 2015b). The SVE system was started on 2 June 2015 and was operated until 15 June 2015. Excavation and confirmation sampling activities were conducted from November 2015 through March 2016.

4.3.4 OU-4

The protective soil cap at the South Desert Village within SS019 is subject to O&M requirements, which are the responsibility of the land owner, ASU. The O&M Manual (IT, 1999a) requires that the owner perform the following:

- Maintain the protective cap boundary and individual dwelling signage;
- Act as primary contact for a planned breach of the protective cap;
- Review and approve work plans for activities that would involve a penetration of the protective cap;
- Include a map of the South Desert Village affected area in any utility blue stake request;
- Distribute to each job foreman a copy of the South Desert Village Excavation Awareness booklet and retain signed acknowledgment forms;
- Schedule semiannual protective cap inspections;
- Repair any deterioration of the protective soil cap; and
- File inspection documentation and post-construction drawings.

In addition, the O&M Manual requires that the landlord perform the following:

- Inform each tenant about the existence and purpose of the protective cap;
- Instruct each tenant to avoid activities which could breach or contribute to the erosion of the protective cap;
- Request prompt notification of accidental or incidental damage to the protective cap; and
- Distribute to each tenant a copy of the South Desert Village Tenant Awareness booklet, and require signatures as proof of understanding.

The AF has reviewed the semiannual protective cap inspection reports - generally covering the inspections done each June and December beginning in 2001 to the most current issued in January 2015 and finds that all requirements have been met by ASU. The AF has also reviewed several of the work plans for planned (routine) and unplanned (emergency) cap penetrations and the tenant awareness booklets.

4.3.5 OU-6

Annual groundwater monitoring is being performed at SS017 until groundwater monitoring requirements are established in a finalized OU-6 ROD. Current groundwater monitoring performed at SS017 is conducted per the *Final Groundwater Monitoring Work Plan Old Pesticide/Paint Shop Site SS017* (AMEC, 2013j). Groundwater monitoring results are documented in annual reports. The most recent finalized annual groundwater report, which also summarizes results from previous events, is available for the August 2014 event (Amec Foster Wheeler, 2015g).

5.0 PROGRESS SINCE THE LAST REVIEW

5.1 Protectiveness Statements from the Last Review

There has been two previous five-year reviews and one review that was initiated but not finalized *(Pre-Concurrence Copy Second Five-Year Review Report, 2001-2006 for Williams Air Force Base* [Mitretek, 2006]). The protectiveness statements from the *Final Third Five-Year Review Report* (URS, 2012a) are provided in the sections below.

5.1.1 OU-1

"The remedy at OU 1 currently protects human health and the environment because there is no current exposure to site contamination. However, in order for the remedy to be protective in the long-term, the further characterization of VOCs in groundwater and soil gas at LF004 and evaluation of potential modifications to the current remedy must be completed to ensure long-term protectiveness."

5.1.2 OU-2

"The remedy at OU-2 currently protects human health and the environment because there is no current exposure to site contamination. However, in order for the remedy to be protective in the long-term, a remedial alternatives evaluation and ROD Amendment must be completed to modify the current groundwater and soil remedies to achieve remedial action objectives."

5.1.3 OU-3

"The remedy at OU-3 currently protects human health and the environment because there is no current exposure to site contamination. However, in order for the remedy to be protective in the long-term, evaluation of the current remedy performance and adopted ICs must be carried out and, as necessary, a ROD Amendment completed to incorporate any proposed modifications into a final remedy."

5.1.4 OU-4

"The remedy at OU 4 currently protects human health and the environment because there is no current exposure to site contamination. However, in order for the remedy to be protective in the long-term, ICs must be completed for SS020 (Skeet Range) and SS024 (Building 1010 - Entomology)."

5.1.5 OU-5

"While there were nine sites identified in the OU-5 ROD, only site DP028, the sewage sludge trenches that were addressed under the OU-1 LF004 Landfill cap, triggers the requirement for a five-year review. DP028 is addressed as part of LF004. See OU-1 protectiveness statement."

5.1.6 OU-6

"The protectiveness statement is deferred because the OU-6 ROD has not been finalized."

5.2 Status of Recommendations from Last Review

The status of the recommendations from the last review is shown in Table 5-1. As discussed in Section 5.1, there has been two previous five-year reviews (IT, 2001 and URS, 2012a) and one review that was initiated but not finalized (Mitretek, 2006). The recommendations provided in Table 5-1 are from the *Final Third Five-Year Review Report* (URS, 2012a).

5.3 Results of Implemented Actions

The implemented actions have been partially successful in addressing recommendations from the previous review as discussed under the current status in Table 5-1.

5.4 Status of any Prior Issues

Table 5-1 provides the status of the recommended actions identified in the *Final Third Five-Year Review Report* (URS, 2012a).

Table 5-1 Status of Recommendations and Follow-Up Actions

OU	Issue or Deficiency	Recommendation/ Follow-up Action(s)	Responsible Agency(ies)	Milestone Date	Current Status
OU-1	LF004. Rising groundwater and nature and extent of contamination in groundwater not fully delineated.	Develop a FS and appropriate decision documents, and implement any supplemental remedy. Collect data and perform studies as needed to support these activities.	AF	CY 2013	Completed. A FFS was completed to evaluate remedial alternatives for soil gas and groundwater impacts at LF004. Amended PP for OU-1, LF004 identified FFS IWAS, Oxidation and SVE as the preferred soil gas and groundwater alternative. ROD Amendment completed for selected remedy. Selected remedy is currently being implemented. (AF, 2013a; AMEC, 2013a; 2014e)
OU-2	ST012. Soil action levels specified in ROD no longer considered valid.	Perform a FFS to determine appropriate long-term remedy for soil and groundwater, finalize decision documents, and implement remedy as needed.		CY 2011 - 2013 (Containment System) CY 2012 (FFS)	The OU-2 ROD Amendment 2 was completed for groundwater only. An additional FFS is required for evaluation shallow and deep soils. Deep soil remediation is currently on-going. (AMEC, 2013b)
	ST012. Current groundwater remedy is ineffective.			CY 2013 (Decision Document) CY 2014 + (Implement Remedy)	A FFS was completed to evaluate remedial alternatives for groundwater at ST012. Amended PP for OU-2, identified SEE and EBR as the preferred groundwater remediation alternative. A second ROD Amendment was completed for selected remedy. Selected remedy is currently being implemented. (AF, 2013b; AMEC, 2012a; 2013b)
OU-3	FT002. The RAs implemented did not achieve unrestricted RGs, but DEUR and AF property ownership provides protectiveness.	Conduct additional sampling to update site characterization and to evaluate whether ICs (use restrictions) will be the long-term remedy, if additional RA is appropriate, or whether there is no unacceptable risk for unrestricted use. Pursuant to the results of this evaluation, an OU-3 ROD Amendment may be needed and a closure report will be prepared.	AF	CY 2012	An additional Site Closure Investigation was conducted to update site conditions and provide supplemental information for risk evaluation at Site FT002. Alternative FT02-4: SVE, originally determined to be a protective and viable remedy from the OU-3 ROD, was selected as the remedial approach. The remedial actions were implemented. from June 2014 through January 2016. The AF is currently drafting a closure report based on the final results of confirmatory soil and soil gas sampling following the RAs which is expected to be finalized in September 2016. (IT, 1996b; AMEC, 2014b; 2015b)
OU-4	SS020. Lack of enforceable ICs (Skeet Range portion).	Airport authority to implement DEUR.	Phoenix-Mesa Gateway Airport Authority	CY 2012	Completed. DEUR recorded on 24 October 2012.

Table 5-1 Status of Recommendations and Follow-Up Actions

OU	Issue or Deficiency	Recommendation/ Follow-up Action(s)	Responsible Agency(ies)	Milestone Date	Current Status
OU-4	SS024. Lack of enforceable ICs.	Coordinate with City to implement DEUR. Notify the City that any transfer prior to completion of DEUR must address restriction of the property to non-residential use.	AF	CY 2015	Completed. DEUR recorded by the City of Mesa on 14 April 2015.
OU-6	SS017. Dieldrin contaminated soil remains at depths exceeding 4 meters.	Complete OU-6 Amended PP and ROD to select remedy.	AF	CY 2012	The OU-6 Draft Final Amended PP was issued for the EPA and ADEQ review and comment which recommended implementing groundwater monitoring and IC elements for SS017 and NFA was proposed for BPW6. A Draft OU-6 ROD was issued selecting remedies proposed in the Draft Final Amended PP. The Draft OU-6 ROD was not finalized nor executed. Subsequent to issuing the Draft Final Amended PP, a SRA was conducted to provide an updated risk characterization for Site SS017. In 2015, Draft Final Amended PP was issued to the EPA and ADEQ, which proposed a selected remedy of NFA for SS017. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017. The outcome of the alternative dispute resolution is expected in May 2016. (AFRPA, 2011; 2015; AMEC, 2014c; URS, 2012b)
	SS017. Final remedies for OU-6 sites not codified.				

Notes:

ADEQ - Arizona Department of Environmental Quality
AF - Air Force
AFBCA - Air Force Base Conversion Agency
ASU - Arizona State University
BEM - BEM Systems, Inc.
DEUR - Declaration of Environmental Use Restriction
DP - Decontamination Pad
EBR - Enhanced Bioremediation
EPA - U.S. Environmental Protection Agency
ESD - Explanation of significant difference
IC - institutional control
IRP - Installation Restoration Program
FFS - Focused Feasibility Study
IT - IT Corporation
IWAS - In-well Air Stripping
IWF - Investigative Waste Facility
NA - not applicable
No. - number
O&M - operations and maintenance
OU - operable unit
PCB - polychlorinated biphenyls
PP - Proposed Plan
ROD - Record of Decision
SEE - Steam Enhanced Extraction
SRA - Supplemental Risk Assessment
SVE - soil vapor extraction
UST - underground storage tank
VEMUR - Voluntary Environmental Mitigation Use Restriction

Final Amended PP for Landfill 004 (AF, 2013a)
Final FFS, Site LF004 (AMEC, 2013a)
Final ROD Amendment, Operable Unit 1, Site LF004 (AMEC, 2014e)
Final Amended PP for Operable Unit 2 (AF, 2013b)
Final FFS, Remedial Alternatives for Operable Unit 2, Site ST012 (AMEC, 2012a)
Final ROD Amendment 2, Groundwater, Operable Unit 2 (AMEC, 2013b)
Final ROD, Operable Unit 3 (OU-3) (IT, 1996b)
Final UFP-QAPP, Remedial Action and Site Closure Work Plan, Fire Protection Training Area, Site FT002 – Eastern Burn Pit (AMEC, 2014b)
Final Remediation Construction Completion and Startup Report, Fire Protection Training Area Site FT002 (AMEC, 2015b)
Draft Final PP for Operable Unit 6 (AFRPA, 2011)
Draft Final PP for Operable Unit 6 (AFRPA, 2015)
Final SRA, Old Pesticide/Paint Shop, Site SS017 (AMEC, 2014c)
Draft ROD for Operable Unit 6 (OU-6) (URS, 2012b)

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

This fourth AF five-year review of the former Williams AFB was contracted by the AFRPA through AFCEC and supported by Amec Foster Wheeler. At the September 2015 RAB meeting, members were notified of the initiation of the five-year review process. Review team members include the following:

- Cathy Jerrard — AFCEC/CIBW-Project Manager/COR
- Wayne Miller — ADEQ Project Manager
- Carolyn d'Almeida — EPA Region 9
- Donald Smallbeck — Amec Foster Wheeler-Technical Lead

The Five-Year Review report is planned to be finalized by August 2016.

6.2 Community Notification and Involvement

The community is involved in the AF's RA program at the former Williams AFB through the RAB. The AF invited RAB members, property owners, lessees and stakeholders to participate in a survey. The invitation was extended verbally at the September 2015 RAB meeting and via a letter dated 9 March 2016. Additionally, the AF ran a display ad inviting the general public to participate in the Five-Year Review (see Figure 6-1). The advertisement ran in the East Valley Tribune on 17 and 24 December 2015, and in the Queen Creek/San Tan Independent and the East Mesa Independent on 16 and 23 December 2015.

Participants were offered the opportunity to participate via in-person interviews, telephone interviews, or through email. Interview questions were developed based on the EPA Comprehensive Five-Year Review Guidance (EPA, 2001), Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance (EPA, 2011) and previous five-year review questionnaires developed for the Williams AFB. Questions are issues-oriented and designed to assess the community's satisfaction with site remedies, identify any unknown activities at the site, and receive any concerns about cleanup operations and community involvement.

In addition, in accordance with EPA guidance, the AF will notify the community of the completion of the review process and finalization of the fourth five-year review. This notice will briefly summarize the review, note how and where the public can view the report, and list points of contact for community members who would like to obtain more information or ask questions about the results of the review.

6.3 Document and Data Review

In the evaluation of human health risks, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection were reviewed for consistency with current

conditions and published data. Specifically, sources of current information used to assess whether cleanup levels selected in RODs are protective included, but were not limited to:

- 40 CFR Part 141, Subpart O, Appendix A to Subpart O of Part 141 - Regulated Contaminants for listing of current MCLs;
- Regional Screening Levels (RSLs) - Generic Tables (November 2015) as downloaded from http://www.epa.gov/risk/regional-screening-levels-rsls (EPA, 2015a);
- Arizona Title 18, Chapter 11, Article 4, Arizona Aquifer Water Quality Standards; and
- Arizona Title 18, Chapter 7, Article 2, Appendix A Soil Remediation Levels.

6.4 Site Inspection

Mr. Brian Newhouse and Ms. Rachel Peterson (Amec Foster Wheeler) conducted the site inspections on 6 to 7 January 2016. For facilities located in secured areas of the airport, Mr. Newhouse and Ms. Peterson were escorted by Mr. Chad Willis (Environmental & Archaeological Coordinator, PMGAA). These site inspections are summarized below with photographs provided in Appendix A and Land Use Control/IC Inspection Checklists provided in Appendix B.

6.4.1 OU-1

LF004 (Landfill) and DP028 (Sewage Sludge Trenches). LF004 and DP028 are secured with intact fences and locked gates. Signs are clearly posted on the fence indicating, "US Air Force Property, No Trespassing or Hunting Allowed" (in both English and Spanish). The cap is inspected and maintained annually by the Air Force. The landfill cap and other remedy components including the interceptor trench are in good condition. Operating remedy components of the IWAS and SVE systems are intact and in operable condition. The SVE treatment compound is secured by a secondary perimeter fence. The groundwater monitoring wells in and around the landfill are individually locked and in good condition. There are no indicators of land use or activities that are inconsistent with the selected remedy.

6.4.2 OU-2

ST012 (Former Liquid Fuels Storage Area). System equipment associated with SEE treatment and SVE operating remedies for soil vapor and groundwater were intact and operable. At the time of the inspection, the steam generation system was offline for maintenance. Monitoring wells are generally in good condition and inspected a minimum of annually and repaired if needed. Monitoring wells outside the secured perimeter fence are not secured with locking vaults or caps; however, the wells contain equipment which may prohibit the use of locking caps. Site access is restricted by a perimeter fence and locked gates when operators are not on site. One separation in the eastern perimeter fence was noted during this inspection (See Photo 19 of Appendix A). No unauthorized access has been recorded. Contact and project information signage including the use of personal protective equipment are posted at main access gate. There are no indicators of land use or activities that are inconsistent with the selected remedy.

6.4.3 OU-3

FT002 (Fire Protection Training Area No. 2). The site is located within an unsecured portion property of the Phoenix-Mesa Gateway Airport. The AF retains ownership of a parcel of land designated the Easter Burn Pit. There is no visual evidence of the former fire protection training area. Like the surrounding area, the area is rocky with sporadic grassy vegetation. Fencing is located around one SVE well and other remedy components left in place. No signage is posted around the site. There are no indicators of land use or activities that are inconsistent with the selected remedy.

6.4.4 OU-4

SS016 (Electroplating/Chemical Cleaning Shop, Building 1085). Building 1085 is located within the secured property of the Phoenix-Mesa Gateway Airport. The building is located in close proximity to the runway. The property is currently being leased by PGMAA to Able Engineering as an industrial/commercial warehouse primarily for storage. There is no evidence of residential use or vandalism. The building remains locked outside of normal business hours. There are no indicators of land use or activities that are inconsistent with the selected remedy.

SS019 (Former Skeet Range at South Desert Village). The site consists of a former skeet range which has subsequently been converted to a residential neighborhood. A portion of the South Desert Village residential neighborhood (approximately 86 houses) are co-located with a 6-inch protective soil cap. The protective cap appeared to be in good condition with no evidence of disturbance. Required protective soil cap signage was posted at residences and in open areas. There are no indicators of land use or activities that are inconsistent with the selected remedy.

SS020 (Firing Range/Skeet Range). The Firing Range and nearby Skeet Range are located on the northern edge of the former base, just south of Perimeter Road, and north of the intersection of Taxiway No. 5 and the east runway. The Skeet Range consists of a large open area with sparse vegetation. The Firing Range (Facility 927) is currently being used as a storage building for the Phoenix-Mesa Gateway Airport. The area is located within the secured property of the Phoenix-Mesa Gateway Airport. The Firing Range structure remains in place, but not in use. The Firing Range area is used for miscellaneous storage of airport-related equipment. The Skeet Range area is located at the end of the runway, and maintained as part of the runway area (open and clear). There are no indicators of land use or activities that are inconsistent with the selected remedy.

SS021 (Facilities 1020/1051). This site consists of two buildings located along East Pecos Road near the south-central part of the former base (Facility 1020 - the firing buttress and Facility 1051 - the Bore Sighting bunker). The facilities are currently used for storage or vacant. Between the buildings is vegetated native desert. The area is located within the property of the Phoenix- Mesa Gateway Airport. The area is not located within a secured portion of the Phoenix-Mesa Gateway Airport, however access is limited through the area. Building 1020 is open and used for storage by the airport. Building 1051 is open and unoccupied. There is no evidence of residential use, vandalism or trespassing. There are no indicators of land use or activities that are inconsistent with the selected remedy.

SS024 (Former Entomology Shop Building 1010). This site consisting of Building 1010 was known as the base pesticide shop, and is located near the southwest corner of the base, south of East Pecos Road (now Old Pecos Road) and north of the WWTP. The building is secured by a perimeter fence. The two access gates were locked at the time of the inspection. There was no evidence of residential use. A section of barbed wire fence along the northeast corner was damaged. Additionally, a section of eastern exterior wall was damaged exposing building insulation. Signage was visible on the northern gate. Signage on the east gate was obscured by vegetation overgrowth. There are no indicators of land use or activities that are inconsistent with the selected remedy.

6.4.5 OU-5

DP028 (Sewage Sludge Trenches). See discussion under OU-1, LF004. There are no indicators of land use or activities that are inconsistent with the selected remedy.

6.4.6 OU-6

SS017 (Old Pesticide/Paint Shop, Base Production Well, BPW6). The site is behind secured and locked fences and gates. Entrance gate has sign indicating access to authorized personnel only. Monitoring wells located on the property are in good condition secured by perimeter fencing and/or locking caps.

6.5 Interviews

On 9 March 2016, interview questionnaires were circulated to 114 key stakeholders, RAB members and BCT members. The interview questions were developed based on the USEPA Comprehensive Five-Year Review Guidance (EPA, 2001) and Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance (EPA, 2011). Questions were issues-oriented and designed to assess the community's satisfaction with site remedies, identify any unknown activities at the site, and receive any concerns about cleanup operations and community involvement.

A total of eight interview responses were received. Responses to interview questions were received from one BCT member, four stakeholders and three RAB members.

A summary of the responses are provided in Table 6-1. In general, response to the progress of cleanup program at the former Williams AFB has been positive. Interview participants generally feel well informed about the activities and progress. Interview participants noted effect to the surrounding community has been road restrictions and the loss of the airport cell phone lot (currently incorporated in the SEE treatment area).

Table 6-1 Summary of Interview Questionnaire Responses

Interview Question	Response		
	RAB Members	BCT Members	Stakeholders
		All Participants	
1. What is your overall impression of the environmental cleanup project at the former Williams Air Force Base?	• In comparison with other base cleanup that I have been included with, Williams is the best, most efficient and best use of land and facilities. Clean up is going very well and is well done. • I think that there was a very weak effort several years ago. The current effort is much better and takes the issue more seriously. • Very good.	• The program has made significant progress during the past 5 years. Two ROD Amendments were completed and remediation activities were started or continued at five sites. • Overall progress has been rapid and mostly effective, much progress has been made under the performance based contract. • Progress on most fronts.	• Handled professionally and collaboratively. • The Town of Gilbert is pleased with the progress made in the last few years in discovering and cleaning up the several contamination sites on the former Base. The treatments and monitoring have been thorough and exhaustive, showing a commitment by the Air Force to remediate the groundwater contamination. • I believe the cleanup at the Air Force Base is continuing along very well. • Finally on a better track with the latest cleanup contract.
2. What effects have cleanup operations at the former Williams Air Force Base had on the surrounding community?	• Greatly increased economic impact on community. • I do not believe that the clean-up effort has impacted the local community in any way. • Cleaner air.	• Short-term negative effects have resulted from remediation activities at site ST012 in the form of road closures and closure of the airport's cell phone lot. Drilling and remediation activities at site ST035 had a minor negative effect at the ASU campus. The continued dispute at site SS017 has resulted in a significant delay in transferring that property to ASU. • Major impact on South Desert Village residential in elect areas. Moderate impact on ASU campus (select areas). Minimal to moderate impact on Gateway Airport (as far as I can tell) with cell phone/taxi lot restriction: But maybe moderate impact with respect to expansion and use plans. Unknown, but maybe substantial impact to development opportunities on some areas (stigma associated with NPL designation).	• Loss of the use of Airport cell phone lot. Inconvenience for passengers. Limited access to certain areas of airport property. • None that Gilbert is aware of. • I do not think the cleanup operations have had any effects other than good will.
3. Are you aware of any community concerns regarding cleanup remedies at former Williams Air Force Base or its operation and administration? If so, please give details.	• No concerns. • I am not aware of any community concerns about the clean-up at the base. In fact, I think that the community, in general, knows very little about the effort. • Not that I am aware of.	• Concerns were raised regarding potential air quality issues as a result of ST035 remedial system operation, but it has was determined that remedial activities did not have a negative effect on air quality. • No • South Desert Village has age and land use restrictions. Vacant lots have restrictions (Former Liquid Fuels storage area and surrounding open space). Restrictions on land use and exposure with landfill south of Old Pecos Road alignment. Water tower lot use is restricted. ASU employee concern regarding vapor intrusion into buildings near former Building 760 area (former shop/gas convenience store). Land use-restriction on vacant land near former fire training bum pit sites east of Sossaman Road. Land use restriction at other former UST, industrial use, and/or release areas.	• None from airport prospective. • No. • I am not aware of any concerns regarding the Air Force cleanup efforts.

Table 6-1 Summary of Interview Questionnaire Responses

Interview Question	Response		
	RAB Members	BCT Members	Stakeholders
		All Participants	
4. Are you aware of any events, incidents, or activities at the former Williams Air Force Base such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.	• Not heard of any. • No. • No.	• There has been periodic evidence of trespassing at the landfill site LF004, and I believe there was one report of theft of contractor equipment also at site LF004. • No, not specifically. • A couple of spills at ST012 liquid fuel storage area remediation site. Uncharacterized petroleum release to City of Mesa Wastewater system from an undocumented source. Observed some unsecured access points SSO17, ST012, LF004,,etc. Anecdotal stories of trespass and theft at LF004.	• No. • No. • I am not aware of any of these events.
5. Do you feel well informed about the former Williams Air Force Base cleanup activities and progress?	• Yes. • Yes, I sit on the RAB and read the minutes when they are sent. • Yes very much so.	• Yes. The Air Force conducts monthly teleconferences and quarterly meetings with regulatory agencies. Numerous public RAB meetings were held during the past five years to inform the community members of site activities, and the Air Force has responded to public inquiries as a result. • Yes, however I wish we had better characterization data for the ST12 Fuels Spill site before it was designed. We were provided the workplan to review before characterization was completed; choices were made in the field and prior to characterization without agency input that may affect the long term success of this project. • For the most part.	• Mostly. • Yes, I feel I am well informed. • As a participant in the Restoration Advisory Board meetings, I do receive the annual updates, but the general public probably has a different awareness level. The information regarding the cleanup activities and progress that is available on the ADEQ website does not show much activity after the 2013 reports. I think an annual report should be added to the website, even to denote "No Activity". • Up to a point – we hear what they want the Agencies to know.
6. Do you have any comments, questions, suggestions, or recommendations regarding management or operation of the environmental cleanup at the former Williams Air Force Base?	• No. • No. I was glad to see the improvement in the attitude and effort of the Air Force and their contractors. • No.	• The Air Force has done a good job managing the progress of remediation and informing stakeholders and community members of site activities. •Do it right the first time is always the most cost effective response. We are here to help you. Thorough initial characterization is critical to the success of any project. Involve the regulators in the project planning in advance of making decisions, rather than informing the agencies after decisions have already been made. Don't put burden of financial risk on contractors for a poorly characterized site as this impacts the long term effectiveness of the response. • Progress is being made at some areas. Not confident about aquifer/soil restoration to pre-industrial use conditions, or if all contamination accounted, in some areas.	• No. • Gilbert recommends continuing clean up, monitoring and reporting of the groundwater quality at the former Williams Air Force Base until Drinking Water Quality Standards are met in the associated aquifer. • I have no further comments or questions. • I recommend that the Air Force look very closely at the contamination that remains at ST-12 outside of the thermal treatment area, and evaluate realistically what will be required to meet the ROD cleanup criteria in the desired time frame. It is not clear that it is being evaluated realistically by AMEC. EPA comments (strongly) suggesting that there is a problem with the remaining LNAPL and the EBR plans have been generally ignored. It would appear to me that much of the remaining LNAPL may be outside of AMEC's original scope of work.
7. For community officials, have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.	Not Applicable	• ADEQ is well informed, receives routine communication regarding site activities and issues, and has conducted numerous site visits during the past five years.	• Gilbert requests updated groundwater levels in well LF01-W019 on a semi-annual basis from Amec Foster Wheeler, or other contractor hired by the USAF for this site. The groundwater levels from this well are reported to ADEQ by Gilbert per our Aquifer Protection Permit, 105302. The purpose of this groundwater level monitoring was to prove that the Gilbert South Recharge Facility was not raising groundwater levels in the area of the WAFB plume and causing it to move. Recently, Gilbert has installed an alternate piezometer well near the site, on Gilbert property, west of Power road. The groundwater levels from this alternate well are reported to Arizona Department of Water Resources and will likely also be accepted by ADEQ in the near future, or the required monitoring will be removed from the permit. • I have routine communications and conduct inspections of this site and have found all site visits and communications satisfactory.

Table 6-1 Summary of Interview Questionnaire Responses

Interview Question	Response		
	RAB Members	BCT Members	Stakeholders
All Participants			
Property Owners			
8. Are property owners and lessees aware of, and complying with, institutional controls?	Not applicable	Not applicable	• Yes, to the best of our knowledge.
9. Does the property owner have any plans to lease, sell or transfer the property? If so, what are their plans regarding the property's institutional controls?			• Airport property and will not be sold. No current plans to lease property.
10. Has land use changed or is it anticipated to change (e.g., housing developments, either constructed or planned, exist in the area)?			• Not aware of any.
11. Are any covenants or easements relevant to the remedy held by the property owner in addition to those selected in the remedy decision documents?			• Only plans are to install light poles.
12. Are there any new developments or wells, either constructed or planned, in the area of which the entity is aware?			No response.
Institutional Controls Enforcement			
13. Have any breaches of the institutional controls occurred, complaints been filed, or unusual activities been noted at the site? If so, how were they addressed?	Not applicable	• I am not aware of this. • ASU employee concern regarding vapor intrusion into buildings near former Building 760 area (former shop/gas convenience store). Most issues are noted and appear to be addressed. ASU maintains South Desert Village use restrictions and inspections. LF004 trespasses and wear areas mitigated. Spill prevention efforts placed. Vapor intrusion issues appear to be investigated. Some institutional control sites investigated for possible resolution and removal.	Not applicable
14. Are institutional controls being enforced? What is the enforcement plan in the event of an institutional controls breach?		• At least nine (9) areas appear to have some Institutional Control. I am aware of only South Desert Village and LF004 inspections and reports submitted to ADEQ. Enforcement per AZ Rule and Statute. Enforcement timing and effort pending case-by-case judgement decisions by others.	
15. Has the property owner reported on the status of the institutional controls or land use controls as required?		• Yes, we have received the annual inspection reports for the landfill and south desert village caps. • Partially. At least nine (9) areas appear to have some institutional Control. I am aware of only South Desert Village and LF004 inspections and reports submitted to ADEQ.	
16. What type of monitoring is currently being conducted or has been conducted to determine institutional controls compliance (e.g., follow-up inspections)?		• Annual inspections as required by the ROD. • At least nine (9) areas appear to have some Institutional Control. I am aware of only South Desert Village and LF004 inspections and reports submitted to ADEQ.	
17. What procedures are in place for regulatory agencies and property owners to receive notice of any proposed changes to the institutional controls?		• Presume AF will advise us. • Arizona Rule and Statute.	
18. Does the entity have an institutional controls tracking system or other applicable database (e.g., geographic information system maps) to keep information about institutional controls?		• Yes.	
19. Can the institutional controls or engineering controls be registered in the Arizona Bluestake system?		• In theory, but implementation is up to owner.	
20. How has the institutional controls process been working and are there any suggestions for improvement?		• I am not aware of any current problems with existing Institutional Controls. • At least nine (9) areas appear to have some Institutional Control. I am aware of only South Desert Village and LF004 inspections and reports submitted to ADEQ.	

Notes:

ADEQ - Arizona Department of Environmental Quality
AMEC - AMEC Environment & Infrastructure, Inc.
ASU - Arizona State University.
BCT - BRAC Cleanup Team
EPA - U.S. Environmental Protection Agency
LNAPL - light non-aqueous phase liquid
RAB - Restoration Advisory Board
ROD - Record of Decision
USAF - U.S. Air Force
WAFB - Williams Air Force Base

7.0 TECHNICAL ASSESSMENT

The technical assessment for remedial and removal actions at the former Williams AFB consists of determining whether those actions are, or on completion will be, protective of human health and the environment. To reach a protectiveness determination, EPA guidance recommends that the following three questions be addressed for each site (EPA, 2001):

Question A – Is the remedy functioning as intended by the decision documents?

Question B – Are the exposure assumptions, toxicity data, cleanup standards, and RAOs used at the time of the remedy selection still valid?

Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

Answers to these three questions help ensure that all relevant issues are considered when determining the protectiveness of the remedy.

7.1 OU-1 (LF004)

The selected remedy for soil included installation of a permeable cap over contaminated surface soils, installation of an interceptor trench, erection of a fence around the perimeter of the interceptor trench, imposing land-use restrictions, and performing post-closure monitoring for 30 years (including landfill maintenance, annual visual inspection of soil cap integrity, semi-annual groundwater monitoring, and periodic maintenance of monitoring equipment). The Final ESD incorporated the Sewage Sludge Trenches (DP028), which were adjacent to the landfill, into the selected remedy. The amended LF004 Selected Remedy to treat contaminated groundwater is IWAS and Oxidation, and SVE to treat soil gas.

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** The permeable cap has been effective at restricting exposure to surface soil contaminants. Some erosion has been noted in annual inspections, which is expected, and has been appropriately repaired. Annual landfill inspections have also detected several breaches in the fence, which have been repaired but are often the result of vandalism (fence was cut or bent) (URS, 2012c, AMEC, 2013e; Amec Foster Wheeler, 2015h). Although unauthorized personnel appeared to have accessed the site, it appears to be short-term trespassing as evidenced by the lack of encampments or other signs of habitation. Due to the presence of the cap, there does not appear to be any unacceptable human exposures to contaminated soil resulting from these breaches. “No Trespassing Signs”, located approximately every 200 linear ft of fence, are in good condition.

Implementation of the amended selected remedy has occurred in multiple phases. The first phase consisted of a PDI and involved installation of a set of IWAS wells (LF01-RW01 and LF01-RW02 in the LF01-W17 and LF01-W19 areas, respectively) and monitoring of conditions over the course of a few months. LF01-RW01 was placed into continuous operation on 14 October 2013 and was shutdown on 28 February 2014. LF01-RW02 operated as an IWAS well from 29 October 2013 through 10 January 2014.

On the basis of preliminary IWAS operations, oxidant addition was further evaluated in the LF01-W19 Area. The oxidation portion of the PDI began on 4 March 2014 and concluded on 27 March 2014. Initial efforts included the recirculation of groundwater extracted from LF01-W19, amendment of extracted groundwater with sodium permanganate (for four hours on 4 March 2014 only) and reinjection of the water into LF01-RW02 with a total of approximately 50 gallons of 40% by weight sodium permanganate solution injected. Recirculation was shutdown on 17 March 2014 and was followed by pulsed injection of 18,000 gallons of LF01-W19 groundwater amended with sodium permanganate into LF01-RW02 from 24 through 27 March 2014. Approximately 330 gallons of 40% by weight sodium permanganate solution were injected during this treatment period. Data collected during and after oxidant injection activities indicated sharp declines in COC concentrations in the vicinity of LF01-RW02.

The second phase of remedy implementation was developed in the *Remedial Design and Remedial Action Work Plan* (AMEC, 2014e) based on the results of the PDI. The *Remedial Design and Remedial Action Work Plan* (AMEC, 2014e) identifies SVE for soil vapor in the former AST and southeast landfill areas, IWAS for the LF01-W17 Area, and oxidation for the LF01-W19 Area. Additional information regarding the construction of installed systems is presented in the *Construction Completion/Startup Report for Operable Unit 1 Groundwater and Soil Gas Remedies* (AMEC, 2015a).

- ***System Operations/O&M:*** Annual inspections and semiannual groundwater monitoring have successfully been implemented, and are consistent with ROD and ROD Amendment requirements. IWAS and SVE system sampling and maintenance are performed in accordance with the requirements of the *Remedial Design/Remedial Action Work Plan* (AMEC, 2014e) and the *Construction Completion/Startup Report OM&M* (AMEC, 2015a) and are documented in RA quarterly status reports.

- ***Opportunities for Optimization:*** Groundwater sampling techniques have been optimized by using passive diffusion bags to minimize sampling time and the generation of investigation-derived waste (e.g., purge water).

- ***Early Indicators of Potential Issues:*** No indication of failure of the soil-only remedy selected in the OU-1 ROD was identified during the review. The soil gas and groundwater selected remedy specified by the OU-1 ROD Amendment is currently being implemented to achieve the RAOs.

- ***Implementation of ICs and Other Measures:*** The AF retains property ownership. Fencing and locked gates are in place.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and To Be Considered (TBC) Material:*** Table 7-1a provides a comparison of the RGs based on the chemical-specific applicable or relevant and appropriate requirements (ARARs) specified in the ROD and ROD amendment and the current numerical standards for COCs and COPCs. For this comparison, the current numerical standards are based on the same land use and risk levels as selected in the ROD and ROD Amendment (e.g., residential and 10^{-6} carcinogenic risk) (AFBCA, 1994).

  Of the 39 COPCs identified by media, the current standards for 36 COPCs are the same or a higher concentration than the standard cited in the ROD and ROD Amendment. Three COPCs currently have lower standards than those cited in the ROD: 1,4-dichlorobenzene in soil (3.5 mg/kg versus 13.4 mg/kg and thallium (5.2 mg/kg versus 5.48 mg/kg), and benzo(a)pyrene (0.069 mg/kg vs 0.11 mg/kg). For 1,4-dichlorobenzene and thallium, the maximum detected concentrations of these constituents are less than the current standards. One soil COPC, benzo(a)pyrene, currently has a lower standard than cited in the ROD and the maximum detected concentrations exceeds the current standard of 0.069 mg/kg.

  Of the two groundwater COCs, four degradation product COCs and two soil gas COCs identified, the current standards are the same or a higher concentration than the standard cited in the ROD Amendment.

  Based on this evaluation, the standards and TBCs specified in the ROD are valid and protective. For soil contaminants, the RGs are conservatively low because they assume residential land use and 10^{-6} carcinogenic risk criteria.

- ***Changes in Exposure Pathways:*** The FFS human health risk assessment (AMEC, 2013a) defined that that there are no complete or potentially complete pathways unless current land use changes. The land use and routes of exposure considered in the ROD and ROD Amendment were for residential land use, even though the selected remedy included ICs. The Supplemental RI (URS, 2010) identified PCE and TCE migration via soil gas from the subsurface to indoor air represents the primary potentially complete exposure pathway for a future indoor worker and a future resident. Vapor intrusion to indoor air is a concern principally in the vicinity of the former AST where there are currently no habitable structures. Vapor migration of PCE and TCE to ambient air is a potentially complete pathway of exposure for outdoor workers, construction workers, or future residents; however, the exposure potential is considered insignificant. If groundwater of the Upper Unit is used for domestic or agricultural purposes by workers or residents at the site in the future, exposure to PCE and TCE in groundwater at concentrations exceeding the drinking water MCLs or AWQSs is also possible.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Reference doses and slope factors cited in the OU-1 ROD Amendment were compared to current values. As shown in Table 7-1b, most revisions are fairly minor. One of the more significant revisions was for the oral slope factor for PCE, which has increased approximately one order of magnitude. However, the MCL for PCE in groundwater continues to be 5 µg/L, which is considered protective.
- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology are applicable to the remedy.
- ***Expected Progress Towards Meeting RAOs:*** Implementation of the selected remedy is achieving the primary RG established in the OU-1 ROD of overall protection of human health and the environment by providing a barrier between the contaminated soil and any potential human or environmental receptors. The selected remedy for soil gas and groundwater specified by the OU-1 ROD Amendment is currently being implemented to achieve the established RAOs in calendar year 2020.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

Table 7-1a OU-1, LF004: Comparison of ROD Remedial Goals to Current Standards

Media	Chemical Concern	Units	Range of Detected Concentrations [b]	RG [b]	Basis for RG Selected	Current Standard	Current Standard Citation
GW	Tetrachloroethene [a]	µg/L	0.20 - 86	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Trichloroethene [a]	µg/L	0.16 - 35	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
SG	Tetrachloroethene [a]	mg/m^3	0.2 – 4.6 Shallow 0.098 – 31 Deep	4.2-9.4	EPA residential noncarcinogenic and carcinogenic RSLs for indoor air	11 - 42	EPA Resident Air RSLs noncarcinogenic and carcinogenic (November 2015)
SG	Trichloroethene [a]	mg/m^3	0.2 – 26 Shallow 0.026 – 76 Deep	0.21-0.43	EPA residential noncarcinogenic and carcinogenic RSLs for indoor air	0.48 - 2.1	EPA Resident Air RSLs noncarcinogenic and carcinogenic (November 2015)
Media	**Chemical of Potential Concern**	**Units**	**Range of Detected Concentrations [b,c]**	**RG [b,c]**	**Basis for RG Selected**	**Current Standard**	**Current Standard Citation**
Degradation Products of COCs							
GW	1,1-dichloroethene	µg/L	0.16	7	Federal MCL	7	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	cis-1,2-dichloroethene	µg/L	0.91	70	Federal MCL	70	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	trans-1,2-dichloroethene	µg/L	NA	100	Federal MCL	100	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Vinyl Chloride	µg/L	0.18	2	Federal MCL	2	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
Other COPCs							
GW	Acetone	µg/L	2 - 5	12,000 [e]	EPA Tap Water RSL (November 2013)	14,000	EPA Resident Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Antimony	µg/L	19.2 - 106	6	Federal MCL	6	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Benzene	µg/L	0.6 - 380	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Beryllium	µg/L	1.0 - 1.9	4 [e]	Federal MCL	4	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	bis(2-ethylhexyl)phthalate	µg/L	1.0 - 150	6	Federal MCL	6	Federal MCL (40 CFR Part 141, Appendix A to Subpart O) (syn: di(2-Ethylhexyl)phthalate or DEHP)
GW	Bromodichloromethane	µg/L	0.5 - 1.1	80 [e]	Federal MCL	80	Federal MCL (40 CFR Part 141, Appendix A to Subpart O) - Proxy for Total Trihalomethanes
GW	Cadmium	µg/L	2.5 - 14	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Carbon Disulfide	µg/L	3	720 [e]	EPA Tap Water RSL (November 2013)	810	EPA Resident Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Chromium	µg/L	3.8 - 11,000	100	Federal MCL	100	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Copper	µg/L	6 - 202	1,300 [e]	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)	1,300	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)
GW	Lead	µg/L	1.0 - 90	15 [e]	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)	15	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)
GW	Manganese	µg/L	0.09 - 80	320 [e]	EPA Tap Water RSL (November 2013)	430	EPA Resident Tap Water RSL (November 2015), Non-Diet, Noncarcinogen, HI=1
GW	Methylene chloride	µg/L	1.4 - 7.6	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O) (syn: Dichloromethane)
GW	Nickel	µg/L	9.8 - 15,000	100 [e]	Arizona AWQS, R18-11-406	100	Arizona AWQS, R18-11-406 (Federal MCL Remanded in February 1995)
GW	Nitrate	µg/L	4,000 - 91,000	10,000 [e]	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)	10,000	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Selenium	µg/L	1.0 - 3.8	50	Federal MCL	50	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Silver	µg/L	3.0 - 18	71 [e]	EPA Tap Water RSL (November 2013)	100	Federal MCL (Secondary)
GW	Toluene	µg/L	0.5 - 4.4	1,000	Federal MCL	1,000	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Uranium	µg/L	0.003 - 0.0075	30 [e]	Federal MCL	30	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Zinc	µg/L	6.8 - 2,700	4,700 [e]	EPA Tap Water RSL (November 2013)	6,000	EPA Resident Tap Water RSL (November 2015), Noncarcinogen, HI=1
Soil	1,2,4-Trichlorobenzene	mg/kg	0.037	35.7	AF Risk-Based Allowable Concentration (Residential)	62	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	1,4-dichlorobenzene	mg/kg	0.035 - 0.08	13.4	AF Risk-Based Allowable Concentration (Residential)	3.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)

Table 7-1a OU-1, LF004: Comparison of ROD Remedial Goals to Current Standards

Media	Chemical Concern	Units	Range of Detected Concentrations [b]	RG [b]	Basis for RG Selected	Current Standard	Current Standard Citation
Soil	4,4'-DDD	mg/kg	0.0037 - 0.013	1.34	AF Risk-Based Allowable Concentration (Residential)	2.8	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	4,4'-DDE	mg/kg	0.0021 - 0.1	0.942	AF Risk-Based Allowable Concentration (Residential)	2	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	4,4'-DDT	mg/kg	0.006 - 0.098	0.942	AF Risk-Based Allowable Concentration (Residential)	2	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Alpha-chlordane	mg/kg	0.0017	0.246	AF Risk-Based Allowable Concentration (Residential)	1.9	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), Chlordane
Soil	Arsenic [d]	mg/kg	2 - 4.5	0.32	EPA Region IX PRG, Residential	10	Arizona SRL (Background)
Soil	Benzo(a)pyrene [d]	mg/kg	0.034 - 0.12	0.11	Arizona HBGL (Residential)	0.069	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Beryllium [d]	mg/kg	0.49 - 3.8	1.2 (LF004) 0.14 (DP028)	AF Risk-Based Allowable Concentration (Residential) EPA Region IX (Residential)	150	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Beta-BHC	mg/kg	0.0016 - 0.008	0.178	AF Risk-Based Allowable Concentration (Residential)	0.36	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), HCH (beta)
Soil	bis(2-ethylhexyl)phthalate	mg/kg	0.021 - 0.2	22.9	AF Risk-Based Allowable Concentration (Residential)	39	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Cadmium	mg/kg	1.7	14	AF Risk-Based Allowable Concentration (Residential)	39	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Dieldrin [d]	mg/kg	0.0045 - 0.31	0.02 (LF004) 0.028 (DP028)	AF Risk-Based Allowable Concentration (Residential) EPA Region IX (Residential)	0.034	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Diethylphthalate	mg/kg	0.037	22,000	AF Risk-Based Allowable Concentration (Residential)	49,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Di-n-butylphthalate	mg/kg	0.026 - 0.033	2,330	AF Risk-Based Allowable Concentration (Residential)	6,100	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential), Dibutyl phthalate
Soil	Gamma-chlordane	mg/kg	0.0016	0.246	AF Risk-Based Allowable Concentration (Residential)	1.9	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), Chlordane
Soil	Pentachlorophenol	mg/kg	0.31	2.67	AF Risk-Based Allowable Concentration (Residential)	3.2	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Thallium	mg/kg	0.23 - 0.36	5.48	AF Risk-Based Allowable Concentration (Residential)	5.2	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Zinc	mg/kg	49 - 203	15,600	AF Risk-Based Allowable Concentration (Residential)	23,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)

Notes:

10^{-6} - one in one million
µg/L - micrograms per liter
AF - Air Force
AWQS - Aquifer Water Quality Standards
BHC - benzene hexachloride (pesticide)
CFR - Code of Federal Regulations
COC -chemical of concern
COPC -chemical of potential concern
DDD - dichlorodiphenyldichloroethane
DDE - dichlorodiphenyldichloroethene
DDT - dichlorodiphenyltrichloroethane
EPA - U.S. Environmental Protection Agency
GW - groundwater
HBGL - health-based guidance level
HI - hazard index
MCL - maximum contaminant level
mg/kg - milligrams per kilogram
mg/m^3 - milligrams per cubic meter
OU - operable unit
PRG - preliminary remediation goal
RG - remediation goal
ROD - Record of Decision
RSL - Regional Screening Level
SG - soil gas
SRL - Soil Remediation Level

References and Citations:

[a] Previously COPC in the OU-1 ROD, considered COC in this OU-1 ROD Amendment
[b] Final ROD, Operable Unit 1 - Appendix B (AFBCA, 1994)
[c] Final ROD Amendment, Operable Unit 1, Site LF004 - Appendix B (AMEC, 2014a)
[d] Concentrations include DP028 information.
[e] RG revised by the ROD Amendment

Table 7-1b OU-1, LF004: Comparison of ROD Toxicity Factors to Current Values

Media	Chemical of Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)		Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
		mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	(mg/kg-day)$^{-1}$		(mg/kg-day)-1 [µg/m^3]	µg/m^3
		ROD [a]	Current [c]	ROD [a]	Current [c]	ROD [a]	Current [c]	ROD [a]	Current [c]
GW	Tetrachloroethene	1.0E-02	6.0E-03	NA	4.0E-02	5.1E-02	2.1E-03	1.8E+02 [5.1E-02]	2.6E-04
GW	Trichloroethene	NA	5.0E-04	NA	2.0E-03	1.1E-02	4.6E-02	1.7E-02 [4.9E-06]	4.1E-03
SG	Tetrachloroethene	6.0E-03[b]	6.0E-03	[4.0E-02][b]	4.0E-02	2.1E-03[b]	2.1E-03	[2.6E-04][b]	2.6E-04
SG	Trichloroethene	5.0E-04[b]	5.0E-04	[2.0E-03][b]	2.0E-03	4.6E-02[b]	4.6E-02	[4.1E-03][b]	4.1E-03
Chemical of Potential Concern									
GW	1,1-dichloroethene	5.0E-02[b]	5.0E-02	[2.0E-01][b]	2.0E-01	NA	NA	NA	NA
GW	cis-1,2-dichloroethene	2.0E-03[b]	2.0E-03	NA	NA	NA	NA	NA	NA
GW	trans-1,2-dichloroethene	2.0E-02[b]	2.0E-02	NA	NA	NA	NA	NA	NA
GW	Vinyl Chloride	3.0E-03[b]	3.0E-03	[1.0E-01][b]	1.0E-01	7.2E-01[b]	7.2E-01	[8.8E-06][b]	8.8E-06
GW	Acetone	1.0E-01	9.0E-01	NA	NA	NA	NA	NA	NA
GW	Antimony	4.0E-04	4.0E-04	NA	NA	NA	NA	NA	NA
GW	Benzene	NA	4.0E-03	NA	3.0E-02	2.9E-02	5.5E-02	2.9E-02 [8.3E-06]	7.8E-06
GW	Beryllium	5.0E-03	2.0E-03	NA	2.0E-05	4.3E+00	NA	8.4E+00 [2.4E-03]	2.4E-03
GW	bis(2-ethylhexyl)phthalate	2.0E-02	2.0E-02	NA	NA	1.4E-02	1.4E-02	NA	NA
GW	Bromodichloromethane	2.0E-02	2.0E-02	NA	NA	1.3E-01	6.2E-02	NA	NA
GW	Cadmium	5.0E-04	5.0E-04	NA	NA	NA	NA	6.1E+00 [1.7E-03]	1.8E-03
GW	Carbon Disulfide	1.0E-01	1.0E-01	2.9E-03 [1.0E-02]	7.0E-01	NA	NA	NA	NA
GW	Chromium (III)	5.0E-03	1.5E+00	5.7E-02 [2.0E-01]	NA	NA	NA	4.1E+01 [1.2E-02]	NA
GW	Copper	3.7E-02	4.0E-02	NA	NA	NA	NA	NA	NA
GW	Lead	7.0E-04	NA	6.0E-04 [2.1E-03]	NA	NA	NA	NA	NA
GW	Manganese	7.0E-04	1.4E-01	6.0E-04 [2.1E-03]	5.0E-05	NA	NA	NA	NA
GW	Methylene Chloride	6.0E-02	6.0E-03	8.6E-01 [3.0E+00]	6.0E-01	7.5E-03	2.0E-03	1.7E-03 [4.7E-07]	1.0E-08
GW	Nickel	2.0E-02	2.0E-02	NA	NA	NA	NA	1.7E+00 [4.9E-04]	NA
GW	Nitrate	1.6E+00	1.6E+00	NA	NA	NA	NA	NA	NA
GW	Selenium	5.0E-03	5.0E-03	NA	NA	NA	NA	NA	NA
GW	Silver	3.0E-03	5.0E-03	NA	NA	NA	NA	NA	NA
GW	Toluene	2.0E-01	8.0E-01	6.0E-01 [2.1E+00]	5.0E+00	NA	NA	NA	NA
GW	Uranium	3.0E-03	3.0E-03	NA	NA	NA	NA	NA	NA
GW	Zinc	2.0E-01	3.0E-01	NA	NA	NA	NA	NA	NA

Table 7-1b OU-1, LF004: Comparison of ROD Toxicity Factors to Current Values

Media	Chemical of Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)		Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
		mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	(mg/kg-day)$^{-1}$		(mg/kg-day)-1 [µg/m^3]	µg/m^3
		ROD [a]	Current [c]	ROD [a]	Current [c]	ROD [a]	Current [c]	ROD [a]	Current [c]
Soil	1,2,4-Trichlorobenzene	1.3E-03	1.0E-02	3.0E-03 [1.1E-02]	NA	NA	NA	NA	NA
Soil	1,4-dichlorobenzene	9.0E-02	8.0E-01	1.4E-01 [4.0E-02]	NA	2.4E-02	NA	NA	NA
Soil	4,4'-DDD	NA	NA	NA	NA	2.4E-01	2.4E-01	NA	NA
Soil	4,4'-DDE	NA	NA	NA	NA	3.4E-01	3.4E-01	NA	NA
Soil	4,4'-DDT	5.0E-04	5.0E-04	NA	NA	3.4E-01	3.4E-01	3.4E-01 [9.7E-05]	9.7E-05
Soil	Alpha-chlordane	6.0E-05	5.0E-04	NA	7.0E-04	1.3E+00	3.5E-01	1.3E+00 [3.7E-04]	1.0E-04
Soil	Arsenic	NA	3.0E-04	NA	NA	NA	1.5E+00	NA	4.3E-06
Soil	Benzo(a)pyrene	NA	NA	NA	NA	NA	7.3E+00	NA	NA
Soil	Beryllium	5.0E-03	2.0E-03	NA	2.0E-05	4.3E+00	NA	8.4E+00 [2.4E-03]	2.4E-03
Soil	Beta-BHC	NA	NA	NA	NA	1.8E+00	1.8E+00	1.8E+00 [5.1E-04]	5.3E-04
Soil	bis(2-ethylhexyl)phthalate	2.0E-02	2.0E-02	NA	NA	1.4E-02	1.4E-02	NA	NA
Soil	Cadmium	1.0E-03	5.0E-04	NA	NA	NA	NA	6.1E+00 [1.7E-03]	1.8E-03
Soil	Dieldrin	5.0E-05	5.0E-05	NA	NA	1.6E+01	1.6E+01	1.6E+01 [4.6E-03]	4.6E-03
Soil	Diethylphthalate	8.0E-01	8.0E-01	NA	NA	NA	NA	NA	NA
Soil	Di-n-butylphthalate	1.0E-01	1.0E-01	NA	NA	NA	NA	NA	NA
Soil	Gamma-chlordane	6.0E-05	5.0E-04	NA	7.0E-04	1.3E+00	3.5E-01	1.3E+00 [3.7E-04]	1.0E-04
Soil	Pentachlorophenol	3.0E-02	5.0E-03	NA	NA	1.2E-01	4.0E-01	NA	NA
Soil	Thallium	7.0E-05	NA	NA	NA	NA	NA	NA	NA
Soil	Zinc	2.0E-01	3.0E-01	NA	NA	NA	NA	NA	NA

Notes:

µg/m^3 - micrograms per cubic meter
BHC - Benzene hexachloride (pesticide)
DDD - Dichlorodiphenyldichloroethane
DDE - Dichlorodiphenyldichloroethene
DDT - Dichlorodiphenyltrichloroethane
EPA - U.S. Environmental Protection Agency
GW - Groundwater
IUR -Inhalation Unit Risk
mg/kg-day - milligrams per kilogram per day
m^3/day - cubic meters per day
mg/m^3 - milligrams per cubic meter
NA - not applicable
OU- Operable Unit
RfCi -Inhalation Reference Concentration
RfDo -(oral) Reference Dose
ROD - Record of Decision
SFo -Oral Slope Factor
SG - soil gas

EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs, in units of (µg/m^3)$^{-1}$, older inhalation toxicity values are converted to IURs for cancer risks using the following formulas: IUR (µg/m^3)$^{-1}$ =[SFi (mg/kg-day)$^{-1}$ x (20 m^3 /day) x (0.001 mg/ug)]/70 kg and RfDi [mg/kg-day] = RfCi [mg/m^3] x 20 m^3/day ÷ 70 kg. Non cancer inhalation reference doses are converted to noncancer hazards. Converted IUR and RfCi values are shown in brackets"[ ]" following the original inhalation toxicity value.

[a] Final ROD, Operable Unit 1 , Tables 5-27 and 5-28 (AFBCA, 1994)

[b] Final ROD Amendment, Operable Unit 1, Site LF004 (AMEC, 2014a), Appendix B

[c] U.S EPA Integrated Risk Information System (IRIS).http://www.epa.gov/iris/ Accessed September 2015.

7.2 OU-2 (ST012)

The Final OU-2 ROD requirements included: extraction and treatment of free-phase product and groundwater, with either reinjection or discharge to the base WWTP; bio-enhanced SVE treatment of first 25 ft of soil; and ICs. The Final OU-2 ROD Amendment 1 added bio-enhanced SVE for deep soil (defined as occurring from a depth of 25 ft to the top of the groundwater). The Final OU-2 ROD Amendment 2 specified the selected remedy of SEE and EBR to achieve RAOs for groundwater remediation.

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** An SVE system was operated in 1995 to 1996 to remediate shallow soil (Earth Tech, 1996). The ROD action levels for shallow soil were achieved. Maximum concentrations left in place were benzene (12 mg/kg), toluene (150 mg/kg), ethylbenzene (150 mg/kg), and xylenes (550 mg/kg). Remediation of deep soil has been successful to date and contaminant removal by SVE is ongoing as a part of SEE. Cumulatively, an estimated 1,982,000 lbs (301,500 gallons) of TPH as JP-4 have been removed and treated by the ST012 deep vadose zone SVE system from April 2005 through September 2015 (Amec Foster Wheeler, 2015a). Since startup of the SEE system, the total mass removed as vapor and recovered LNAPL was 1,700,609 lbs of TPH as determined by analytical sampling (Amec Foster Wheeler, 2015a).

- ***System Operations/O&M:*** Shallow soil remediation has been completed, and deep soil and groundwater remediation is ongoing. The deep soils SVE and SEE treatment processes, operations, maintenance and effectiveness are documented in the quarterly performance reporting.

- ***Opportunities for Optimization:*** Seven deep screened interval SVE wells within the SEE thermal treatment zone were shut off and disconnected from the SVE system on 18 August 2014 and will remain disconnected during SEE. The shallow and middle screened interval SVE wells will continue to be connected to the SVE system and the single screen intervals for the five new SVE wells. Up to 25 wells are available for use in the operation of the SVE system, although typically only select wells are operated in order to optimize system performance. Deep soil vapor wells should be considered for use following cession of active steam generation during EBR phase of the current OU-2 ROD Amendment 1 selected remedy.

- ***Early Indicators of Potential Issues:*** No indication of failure of the currently implemented OU-2 ROD Amendment 2 was identified during the review.

- ***Implementation of ICs and Other Measures:*** A DEUR implementing ICs for ST012 was recorded in June 2008 followed by transfer of the property to the WGAA in July 2008. The deed includes restrictions prohibiting excavation to greater than 10 ft bgs; prohibiting use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years of age, and day care centers for

children; and prohibiting groundwater well installations, except for monitoring or RA purposes. The site is fenced and posted and access is controlled.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-2a provides a comparison of the RGs specified in the ROD based on chemical-specific ARARs and the current numerical standards. For this comparison, the current numerical standards are based on the same land use and risk levels as selected in the ROD (e.g., residential and 10^{-6} carcinogenic risk) (IT, 1992a; 1992d).

- For soil, many of the standards specified in the ROD are substantially less stringent than current standards using the same criteria (e.g., residential land use and 10^{-6} carcinogenic risk). For example, the ROD indicated a benzene cleanup level of 45 mg/kg for shallow soil, whereas the current Arizona SRLs for benzene are 0.65 mg/kg for residential and 1.4 mg/kg for industrial. Of the 15 COPCs identified in shallow soil, 14 COPCs currently have lower standards than those cited in the ROD (IT, 1992a). Four COPCs which exceeded the specified ROD cleanup levels prior to remediation and current cleanup levels, 1,4-dichlorobenzene, antimony, chlorobenzene, and lead were not analyzed during confirmatory sampling. Two COPCs, benzene and xylenes, currently has a lower standard than cited in the ROD and the post remediation confirmation sampling concentrations exceeds the current standard of 0.64 and 270 mg/kg, respectively (Earth Tech, 1996).

  Also, for the deep soil where RAs are currently being implemented, the RGs for toluene and naphthalene are also substantially less stringent than current standards. Therefore, the soil RGs specified in the ROD Amendment 1 may not provide long-term protectiveness based on a comparison to current standards.

  All groundwater standards cited in the OU-2 ROD Amendment 2 are equal to or less than current standards, and therefore considered valid and protective.

  A DEUR is in place to prevent residential land use, and current Arizona soil remediation standards (R18-7-205, paragraph E) allow remediating residential property to 10^{-5} carcinogenic risk for any carcinogen other than a known human carcinogen if the site's future use is not intended for a child care facility or school for children below the age of 18. It should be noted that due to the ongoing RAs for deep soil and groundwater, and the site and ICs implemented for protection of human health, the remedy remains protective.

- ***Changes in Exposure Pathways:*** The land use and routes of exposure considered in the ROD, ROD Amendment 1, and ROD Amendment 2 were for residential land use; however, the remedy implemented included ICs. Potential exposures evaluated in the risk assessment and used in the development of RGs are therefore overestimated.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Toxicity factors cited in the OU-2 ROD were compared to current values. As shown in Table 7-2b, most revisions are fairly minor. One of the more significant revisions was the oral reference dose for xylenes, which has decreased approximately one order of magnitude. Additionally, toxicity factors have been establish for benzene, where previously no criteria has been established at implementation of the ROD.

- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology are applicable to this remedy.

- ***Expected Progress Towards Meeting RAOs:*** The selected remedy for deep soil specified by the OU-2 ROD Amendment 1 is currently being implemented to achieve the chemical specific RAOs. The selected remedy for groundwater specified OU-2 ROD Amendment 2 has been implemented to achieve the chemical specific RAOs within 20 years.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

Table 7-2a OU-2, ST012: Comparison of ROD Remedial Goals to Current Standards

OU-2 ROD -Shallow Soil								
Media	**Chemical of Potential Concern**	**Units**	**Maximum Detected Concentration [a]**	**Post Remediation Concentrations [b]**	**RG [a]**	**Basis for RG Selected**	**Current Standard**	**Current Standard Citation**
Shallow Soil	1,2-Dichlorobenzene	mg/kg	140	NS	10,000	Arizona HBGL (IT, August 1992, Table A-4)	600	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	1,3-Dichlorobenzene	mg/kg	130	NS	10,000	Arizona HBGL (IT, August 1992, Table A-4)	530	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	1,4-Dichlorobenzene	mg/kg	180	NS	55	AF Risk-Based Allowable Concentration (IT, August 1992, Table A-4)	3.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Shallow Soil	Acetone	mg/kg	0.91	NS	12,000	Arizona HBGL (IT, August 1992, Table A-4)	14,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Antimony	mg/kg	48	NS	47	Arizona HBGL (IT, August 1992, Table A-4)	31	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Benzene	mg/kg	730	12	45	AF Risk-Based Allowable Concentration (IT, August 1992, Table A-4)	0.65	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Shallow Soil	Bis(2-Ethylhexyl)phthalate	mg/kg	16	NS	95	AF Risk-Based Allowable Concentration (IT, August 1992, Table A-4)	39	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Shallow Soil	Cadmium	mg/kg	2.8	NS	58	Arizona HBGL (IT, August 1992, Table A-4)	39	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Chlorobenzene	mg/kg	300	NS	2,300	Arizona HBGL (IT, August 1992, Table A-4)	150	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Ethylbenzene	mg/kg	410	150	12,000	Arizona HBGL (IT, August 1992, Table A-4)	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Lead	mg/kg	1100	NS	15 - 150	Background Concentrations	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Methylene chloride	mg/kg	0.47	NS	180	Arizona HBGL (IT, August 1992, Table A-4)	9.3	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Shallow Soil	Naphthalene	mg/kg	ND	NS	470	Arizona HBGL (IT, August 1992, Table A-4)	56	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Toluene	mg/kg	1200	150	23,000	Arizona HBGL (IT, August 1992, Table A-4)	650	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Shallow Soil	Xylenes	mg/kg	1500	550	230,000	Arizona HBGL (IT, August 1992, Table A-4)	270	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
OU-2 ROD Amendment 1 -Deep Soil								
Media	**Chemical of Potential Concern**	**Units**	**Range of Detected Concentrations [c]**		**RG [c]**	**Basis for RG Selected**	**Current Standard**	**Current Standard Citation**
Soil (Deep)	Benzene	mg/kg	0.001 - 890		5	PRG based on modeling concentration of contaminants that would result in concentrations at the compliance points greater than action levels for groundwater	0.70	ADEQ GPLs, Minimum GPL based on 2007 chemical properties, November 2008
Soil (Deep)	Naphthalene	mg/kg	3.5 - 14		3,000	PRG based on modeling concentration of contaminants that would result in concentrations at the compliance points greater than action levels for groundwater	56	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil (Deep)	Toluene	mg/kg	0.001 - 1,500		4,000	PRG based on modeling concentration of contaminants that would result in concentrations at the compliance points greater than action levels for groundwater	159	ADEQ GPLs, Minimum GPL based on 2007 chemical properties, November 2008
Soil (Deep)	TPH as JP-4	mg/kg	0.42 - 360,000		2,000	PRG based on modeling concentration of contaminants that would result in concentrations at the compliance points greater than action levels for groundwater	NA	NA

Table 7-2a OU-2, ST012: Comparison of ROD Remedial Goals to Current Standards

OU-2 ROD Amendment 2 - Groundwater									
Media	Chemical of Concern	Units	IT Investigations [d] Range of Detected Concentrations	AV Investigations [d] Range of Detected Concentrations	November 2011 Groundwater Monitoring [e] Range of Detected Concentrations	RG [f]	Basis for RG Selected	Current Standard	Current Standard Citation
GW	Benzene	µg/L	0.6 - 24,000	1.4 - 12,000	0.133F - 8,690	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Toluene	µg/L	86 - 24,000	48 - 21,000	0.379F - 5,020	1,000	Federal MCL	1,000	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Naphthalene	µg/L	4 - 7,200	NS	0.367F - 103	28	Arizona HBGL	28	Arizona HBGL
Chemical of Potential Concern									
GW	Bis(2-Ethylhexyl)phthalate	µg/L	2 - 28	NS	4.12F	6	Federal MCL, Effective January 1994	6	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)(syn: di(2-ethylhexyl)phthalate or DEHP)
GW	1,2-Dichloroethane	µg/L	0.8 - 16	NS	0.263F	5	Federal MCL	5	Federal MCL
GW	Ethylbenzene	µg/L	0.5 - 3,500	1.1 - 2800	0.374F - 1,040	700	Federal MCL	700	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Methylene chloride	µg/L	260 - 282	NS	NS	5	Federal MCL, Effective January 1994	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O) (syn: dichloromethane)
GW	2-Methylnaphthalene	µg/L	6 - 10,000	NS	6 B - 30	27	EPA Regional Screening Level for tap water	36	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	2-Methylphenol	µg/L	2 - 140	NS	NS	720	EPA Regional Screening Level for tap water	930	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	4-Methylphenol	µg/L	6 - 73	NS	3.01 F	1,400	EPA Regional Screening Level for tap water	1,900	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Phenol	µg/L	11 - 180	NS	2.81 - 17	4,200	Arizona HBGL	4,200	Arizona HBGL
GW	Tetrachloroethene	µg/L	0.5 - 1.2	NS	0.257F - 0.574F	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Trichlorofluoromethane	µg/L	0.7 - 2.2	NS	NS	1,100	EPA Regional Screening Level for tap water	5,200	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Xylenes	µg/L	0.6 - 9,800	16 - 5,900	0.938F - 1,646	10,000	Federal MCL	10,000	Federal MCL
GW	Antimony	µg/L	12 - 433	NS	0.559F	6	Federal MCL, Effective January 1994	6	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Chromium(total)	µg/L	4.2 - 54,500	NS	1.32F - 410	100	Federal MCL	100	Federal MCL (40 CFR Part 141, Appendix A to Subpart O)
GW	Copper	µg/L	8.5 - 500	NS	1.59F - 11	1,300	Federal MCL	1,300	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)
GW	Lead	µg/L	1.1 - 79	4 - 17	0.526F - 0.630F	15	Federal MCL	15	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)
GW	Nickel	µg/L	10 - 4,990	NS	3.75F - 416	100	Arizona Aquifer Water Quality Standard	100	Arizona AWQS, R18-11-406 (Federal MCL Remanded in February 1995)
GW	Silver	µg/L	2.9 - 111	NS	NS	100	Federal MCL	100	Federal MCL (Secondary)
GW	Zinc	µg/L	5.9 - 3,969	NS	13.1F - 30.8	1,400	Arizona HBGL	1,400	Arizona HBGL

Notes:

µg/L - micrograms per liter
10^{-6} - one in one million
ADEQ - Arizona Department of Environmental Quality
AMEC - AMEC Environment & Infrastructure, Inc.
AV - AeroVironment, Inc.
AWQS - Aquifer Water Quality Standards
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
GPL - Groundwater Protection Level
GW - groundwater
HBGL - health-based guidance level
IT - IT Corporation
JP-4 - jet propulsion fuel grade 4
MCL - Maximum Contaminant Level
mg/kg - milligrams per kilogram
NA - not applicable
ND - not detected
NS - not Sampled / not Evaluated
OU- operable unit
PRG - preliminary remediation goal
RG - remediation goal
ROD - Record of Decision
RSL - Regional Screening Level
SRL - Soil Remediation Level
TPH - total petroleum hydrocarbons
URS - URS Corporation

Data Qualifier Definitions:

B - Sample concentration is similar to that found in an associated blank
F - The analyte was positively identified, but the associated concentration is an estimation above the detection limit and below the reporting limit

[a] Final ROD, Operable Unit 2 - Tables in Section 6 and Appendix A (IT, 1992a)
[b] Soil Cleanup and Confirmation Sampling Results - Table 3-2 (Earth Tech, 1996)
[c] Final ROD Amendment, Deep Soil, OU-2 -Table 5-2 (IT, 1996a)
[d] Final ROD, Operable Unit 2 - Table 4.4 (IT, 1992a)
[e] Annual 2011 Groundwater Monitoring Report (URS, 2012d)
[f] Final ROD Amendment 2 - Appendix B, Table B-2 (AMEC, 2013b)

Table 7-2b OU-2, ST012: Comparison of ROD Toxicity Factors to Current Values

Media	Chemical of Concern / Chemical of Potential Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)	Inhalation Reference Concentration (RfCi)	Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
		mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	(mg/kg-day)$^{-1}$		(mg/kg-day)-1 [µg/m^3]	µg/m^3
		ROD	Current [a]	ROD	Current [a]	ROD	Current [a]	ROD	Current [a]
OU-2 ROD[b] - Shallow Soil COPCs									
Shallow Soil	1,2-Dichlorobenzene	9.0E-02[c]	9.00E-02	NA	NA	NA	NA	NA	NA
Shallow Soil	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Shallow Soil	1,4-Dichlorobenzene	NA	NA	NA	8.0E-01	2.40E-02	NA	NA	NA
Shallow Soil	Acetone	1.0E-01	9.0E-01	1.0E-01 [3.5E-01]	NA	NA	NA	NA	NA
Shallow Soil	Antimony	NA	4.0E-04	NA	NA	NA	NA	NA	NA
Shallow Soil	Benzene	NA	4.0E-03	NA	3.0E-02	2.9E-02[c]	5.5E-02	NA	7.8E-06
Shallow Soil	Bis(2-Ethylhexyl)phthalate	2.00E-02	2.0E-02	2.0E-02 [7.0E-02]	NA	1.40E-02	1.4E-02	1.4E-02 [4.0E-06]	NA
Shallow Soil	Cadmium	5.00E-04	5.0E-04	5.0E-04 [1.8E-03]	NA	NA	NA	6.1E+00 [1.7E-03]	1.8E-03
Shallow Soil	Chlorobenzene	NA	2.0E-02	NA	NA	NA	NA	NA	NA
Shallow Soil	Ethylbenzene	1.0E+00[c]	1.0E-01	NA	1.00E+00	NA	NA	NA	NA
Shallow Soil	Lead	NA	NA	NA	NA	NA	NA	NA	NA
Shallow Soil	Methylene chloride	NA	6.0E-03	NA	6.0E-01	NA	2.0E-03	NA	1.0E-08
Shallow Soil	Naphthalene	4.0E-03[c]	2.0E-02	NA	3.0E-03	NA	NA	NA	NA
Shallow Soil	Toluene	2.0E-01[c]	8.0E-01	NA	5.0E+00	NA	NA	NA	NA
Shallow Soil	Xylenes	4.0E+00[c]	2.0E-01	NA	1.0E-01	NA	NA	NA	NA
OU-2 ROD Amendment 1[d] - Deep Soil COPCs									
Soil (Deep)	Benzene	NA	4.0E-03	NA	3.0E-02	2.9E-02[c]	5.5E-02	NA	7.8E-06
Soil (Deep)	Naphthalene	4.0E-03[c]	2.0E-02	NA	3.0E-03	NA	NA	NA	NA
Soil (Deep)	Toluene	2.0E-01[c]	8.0E-01	NA	5.0E+00	NA	NA	NA	NA
Soil (Deep)	TPH as JP-4	NA	NA	NA	NA	NA	NA	NA	NA

Table 7-2b OU-2, ST012: Comparison of ROD Toxicity Factors to Current Values

Media	Chemical of Concern / Chemical of Potential Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)	Inhalation Reference Concentration (RfCi)	Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
		mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	(mg/kg-day)$^{-1}$		(mg/kg-day)-1 [µg/m^3]	µg/m^3
		ROD	Current [a]	ROD	Current [a]	ROD	Current [a]	ROD	Current [a]
OU-2 ROD Amendment 2[e] - Groundwater									
GW	Benzene	4.0E-03	4.0E-03	3.0E-02	3.0E-02	5.5E-02	5.5E-02	7.8E-06	7.8E-06
GW	Naphthalene	2.0E-02	2.0E-02	3.0E-03	3.0E-03	NA	NA	NA	NA
GW	Toluene	8.0E-01	8.0E-01	5.0E+00	5.0E+00	NA	NA	NA	NA
GW	Bis(2-Ethylhexyl)phthalate	2.0E-02	2.0E-02	NA	NA	1.4E-02	1.4E-02	NA	NA
GW	1,2-Dichloroethane	NA	NA	NA	NA	9.1E-02	9.1E-02	2.6E-05	2.6E-05
GW	Ethylbenzene	1.0E-01	1.0E-01	1.00E+00	1.00E+00	NA	NA	NA	NA
GW	Methylene chloride	6.0E-03	6.0E-03	6.0E-01	6.0E-01	2.0E-03	2.0E-03	1.0E-08	1.0E-08
GW	2-Methylnaphthalene	4.0E-03	4.0E-03	NA	NA	NA	NA	NA	NA
GW	2-Methylphenol	5.0E-02	5.0E-02	NA	NA	NA	NA	NA	NA
GW	4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
GW	Phenol	3.0E-01	3.0E-01	NA	NA	NA	NA	NA	NA
GW	Tetrachloroethene (PCE)	6.0E-03	6.0E-03	4.0E-02	4.0E-02	2.1E-03	2.1E-03	2.6E-04	2.6E-04
GW	Trichlorofluoromethane	3.0E-01	3.0E-01	NA	NA	NA	NA	NA	NA
GW	Xylenes	2.0E-01	2.0E-01	1.0E-01	1.0E-01	NA	NA	NA	NA
GW	Antimony	4.0E-04	4.0E-04	NA	NA	NA	NA	NA	NA
GW	Chromium(total)	1.5E+00	1.5E+00	NA	NA	NA	NA	NA	NA
GW	Copper	NA	NA	NA	NA	NA	NA	NA	NA
GW	Lead	NA	NA	NA	NA	NA	NA	NA	NA
GW	Nickel	2.0E-02	2.0E-02	NA	NA	NA	NA	NA	NA
GW	Silver	5.0E-03	5.0E-03	NA	NA	NA	NA	NA	NA
GW	Zinc	3.0E-01	3.0E-01	NA	NA	NA	NA	NA	NA

Notes:

µg/m^3 - micrograms per cubic meter
AMEC - AMEC Environment & Infrastructure, Inc.
COC - chemical of concern
COPC - hemical of potential conern
EPA - U.S. Environmental Protection Agency
GW - groundwater
IT - IT Corporation
IUR - Inhalation Unit Risk
JP-4 - jet propulsion fuel grade 4
kg - kilogram
mg/µg - milligrams per microgram
mg/kg-day - milligrams per kilogram per day
mg/m^3 - milligrams per cubic meter
NA - not applicable
OU- Operable Unit
RfCi -Inhalation Reference Concentration
RfDo -(oral) Reference Dose
ROD - Record of Decision
SFo -Oral Slope Factor
TPH - total petroleum hydrocarbons

EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs, in units of (µg/m^3)$^{-1}$, older inhalation toxicity values are converted to IURs for cancer risks using the following formulas: IUR (µg/m^3)$^{-1}$ =[SFi (mg/kg-day)$^{-1}$ x (20 m^3 /day) x (0.001 mg/ug)]/70 kg and RfDi [mg/kg-day] = RfCi [mg/m^3] x 20 m3/day ÷ 70 kg. Non cancer inhalation reference doses are converted to noncancer hazards. Converted IUR and RfCi values are shown in brackets "[ ]" following the original inhalation toxicity value.

[a] U.S EPA Integrated Risk Information System (IRIS).http://www.epa.gov/iris/ Accessed September 2015.
[b] Final ROD, Operable Unit 2 - Tables 5-5, 5-6, 5-7, and 5-8 (IT, 1992a)
[c] Final Remedial Investigation Report Operable Unit 2 - Section 6.0 text (IT, 1992c)
[d] Final ROD Amendment, Deep Soil, Operable Unit 2 (IT, 1996a)
[e] Final ROD Amendment 2, Operable Unit 2, - Appendix B (AMEC, 2013b)

7.3 OU-3 (FT002)

The Final OU-3 ROD in 1996 required in situ treatment via bioventing of approximately 25,000 cubic yards of soil contaminated with benzene, chloroform, and 1,4-chlorobenzene.

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** Implementation of bioventing and SVE at FT002 was documented as ineffective for removal of VOCs sufficiently to achieve cleanup goals. As a result of a risk evaluation, FT002 was determined to pose no adverse threat to human health and the environment under current non-residential use (BEM, 1998b). In June 2006, the BCT agreed that ICs would be used to prevent future residential use of the site. Subsequently, SVE was implemented based on the results of the soil and soil gas sampling indicated that the VOCs, BTEX, 1,2,4-TMB, and 1,3,5-TMB are present in the subsurface soils at levels that prevent closure to unrestricted uses (AMEC, 2014b). SVE operations were conducted from 2 June 2015 and until 15 June 2015. A field variance specified excavation and removal of the residual 1,2,4-TMB and 1,3,5-TMB from the surface soil is expected to decrease the 1,2,4-TMB concentrations in VMP-2 (Amec Foster Wheeler, 2015b). Two excavations were conducted to remove 1,2,4-TMB and 1,3,5-TMB contaminated soil in November 2015 and January 2016. Excavation confirmation sampling activities were conducted in March 2016.

- ***System Operations/O&M:*** There are no ongoing system operations.

- ***Opportunities for Optimization:*** None identified.

- ***Early Indicators of Potential Issues:*** None identified.

- ***Implementation of ICs and Other Measures:*** A DEUR was implemented in April 2008, and land use restrictions are maintained. The DEUR limits the land use to non-residential and requires that if soil at or below 5 ft bgs, it will be handled, stored, transported, and tested in accordance with disposal requirements for chemically-contaminated materials. Ownership of the site is retained by the AFCEC.

Question B: Are the assumptions used at the time of remedy selection still valid?

- Changes in Standards and TBCs: Table 7-3a provides a comparison of the RGs specified in the ROD and current numerical standards. RGs provided in the ROD cited the AF risk-based allowable concentrations which were calculated under a residential land use and target cancer risk of 10^{-6}. For this comparison, the current numerical standards are based on the same land use and risk levels as selected in the ROD (e.g., residential and 10^{-6} carcinogenic risk) (IT, 1996b).

  A DEUR is currently in place to prevent residential land use, and current Arizona soil remediation standards (R18-7-205, paragraph E) allow remediating residential property to 10^{-5} carcinogenic risk for any carcinogen other than a known human

carcinogen if the site's future use is not intended for a child care facility or school for children below the age of 18.

Of the three COCs identified in soil, two COCs currently have lower standards than those cited in the ROD: benzene (0.65 mg/kg versus 1.4 mg/kg) and 1,4- dichlorobenzene in soil (3.5 mg/kg versus 7.4 mg/kg). For benzene and 1,4- dichlorobenzene, the maximum detected concentrations cited in the ROD exceed the current standards. However, remediation has been implemented to achieve unrestricted use for eventual removal of the DEUR.

Of the 21 COPCs identified by media, the current standards for 13 COPCs are the same or a higher concentration than the standard cited in the ROD. Six COPCs in soil currently have lower standards than those cited in the ROD including: 1,2- dichlorobenzene, chromium, ethylbenzene, methylene chloride, toluene, and xylenes. For these six COPCs, the maximum detected concentrations reported in the ROD are less than the current standards. One groundwater COPC, zinc, currently has a lower standard than cited in the ROD and the maximum detected concentrations exceed the Arizona Domestic Water Source standard of 2,100 µg/L. However, maximum detected concentration of zinc of does not exceed the Federal MCL of 5,000 µg/L.

- ***Changes in Exposure Pathways:*** In 1998, a Receptor Evaluation was performed that concluded there were no unacceptable human health risks or potential for groundwater impacts at Site FT002 and requested unrestricted closure with NFA (BEM, 1998b). ADEQ commented that the risk assessment provided in the Receptor Evaluation may not be sufficient since risks were only evaluated for contaminants reported in the upper 5 ft of soil; therefore, a DEUR was filed limiting the use of Site FT002 to non-residential uses. While not specified as a route of exposure in the ROD, vapor intrusion must be addressed for unrestricted use and removal of the DEUR. Subsequently, soil gas sampling has been conducted to evaluate this exposure pathway. The AF is currently drafting a closure report based on the final results of confirmatory soil and soil gas sampling following the excavations which is expected to be finalized in September 2016.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Table 7-3b provides a comparison of the toxicity factors cited in the ROD and the current factors. Changes in standards are considered minor.

- ***Changes in Risk Assessment Methodologies:*** No changes in methodology affect the protectiveness of the remedy.

- ***Expected Progress Towards Meeting RAOs:*** Chemical specific RAOs specified in the OU-3 ROD have been achieved with additional RAs conducted in June 2015.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

Table 7-3a OU-3, FT002: Comparison of ROD Remedial Goals to Current Standards

Media	Chemical of Concern	Units	Range of Detected Concentrations [a]	RG [a]	Basis for RG Selected	Current Standard	Current Standard Citation
Soil	Benzene	mg/kg	2 - 83	1.4	Risk-Based Calculated Allowable Concentration	0.65	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Chloroform	mg/kg	1 - 2.0	0.53	Risk-Based Calculated Allowable Concentration	0.94	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	1,4-Dichlorobenzene	mg/kg	2 - 56	7.4	Risk-Based Calculated Allowable Concentration	3.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Chemical of Potential Concern							
GW	Acetone	µg/L	2.0 - 4.0	610	Risk-Based Calculated Allowable Concentration	14,000	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Carbon disulfide	µg/L	1.0 - 6.0	21	Risk-Based Calculated Allowable Concentration	810	EPA Tap Water RSL (November 2015), Noncarcinogen, HI=1
GW	Lead	µg/L	6.0 - 21.0	15	Federal MCL	15	Federal Action Level (40 CFR Part 141, Appendix A to Subpart O)
GW	Methylene chloride	µg/L	0.7 - 6.0	5	Federal MCL	5	Federal MCL (40 CFR Part 141, Appendix A to Subpart O) (syn: Dichloromethane)
GW	Zinc	µg/L	340 - 3,800	5,000	Federal MCL	2,100 T	Arizona R18-11, Appendix A, Domestic Water Source Standard (T = Total Recoverable)
Soil	1,2-Dichlorobenzene	mg/kg	3 - 23	2,300	Risk-Based Calculated Allowable Concentration	600	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Acetone	mg/kg	0.01 - 0.02	2,000	Risk-Based Calculated Allowable Concentration	14,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Bis(2-ethylhexyl)-phthalate	mg/kg	0.19 - 1.2	32	Risk-Based Calculated Allowable Concentration	39	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Cadmium	mg/kg	2.0 - 4.0	38	Risk-Based Calculated Allowable Concentration	39	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Carbon disulfide	mg/kg	-	NA	Risk-Based Calculated Allowable Concentration	360	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Chromium	mg/kg	14 - 16	210	Risk-Based Calculated Allowable Concentration	30	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential) (Assumed Chrome VI)
Soil	Copper	mg/kg	20	2,800	Risk-Based Calculated Allowable Concentration	3,100	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Ethylbenzene	mg/kg	1 - 63	2,900	Risk-Based Calculated Allowable Concentration	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Lead	mg/kg	4.0 - 70	400	Risk-Based Calculated Allowable Concentration; Arizona HBGL	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Mercury	mg/kg	5.9	23	Risk-Based Calculated Allowable Concentration	23	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Methyl ethyl ketone (MEK)	mg/kg	13 - 610	8,700	Risk-Based Calculated Allowable Concentration	23,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Methylene chloride	mg/kg	3 - 8	11	Risk-Based Calculated Allowable Concentration	9.3	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
Soil	Nickel	mg/kg	13 - 17	1,500	Risk-Based Calculated Allowable Concentration	1,600	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Toluene	mg/kg	3 - 130	1,900	Risk-Based Calculated Allowable Concentration	650	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Xylenes	mg/kg	2 - 240	980	Risk-Based Calculated Allowable Concentration	270	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
Soil	Zinc	mg/kg	51 - 60	23,000	Risk-Based Calculated Allowable Concentration	23,000	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)

Notes:

µg/L - micrograms per liter
10^{-6} - one in one million
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
GW - groundwater
HBGL - health-based guidance level
HI - Hazard Index
IT - IT Corporation
MCL - maximum contaminant level
mg/kg - Milligrams per kilogram
NA - not applicable
OU - Operable Unit
RG - remediation goal
ROD - Record of Decision
RSL - regional screening level
SRL - Soil remediation level.
T - total recoverable

[a] Final ROD, Operable Unit 3 (OU-3) - Appendix A and C (IT, 1996b)

Table 7-3b OU-3, FT002: Comparison of ROD Toxicity Factors to Current Values

Media	Chemical of Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)		Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
		mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	(mg/kg-day)$^{-1}$		(mg/kg-day)-1 [µg/m^3]	µg/m^3
		ROD[a]	Current [b]	ROD[a]	Current [b]	ROD[a]	Current [b]	ROD[a]	Current [b]
Soil	Benzene	NA	4.00E-03	NA	3.0E-02	2.90E-02	5.50E-02	2.9E-02 [8.3E-06]	7.8E-06
Soil	Chloroform	1.00E-02	1.00E-02	NA	NA	6.40E-03	NA	8.1E-02 [2.3E-05]	2.3E-05
Soil	1,4-Dichlorobenzene	NA	8.00E-01	2.4E-02 [8.4E-01]	NA	2.40E-02	NA	NA	NA
Chemical of Potential Concern									
GW	Acetone	1.00E-01	9.00E-01	NA	NA	NA	NA	NA	NA
GW	Carbon disulfide	1.00E-01	1.00E-01	2.9E-03 [1.0E-02]	7.0E-01	NA	NA	NA	NA
GW	Lead	NA	NA	NA	NA	NA	NA	NA	NA
GW	Methylene chloride	6.00E-02	6.00E-03	8.6E-01 [3.0E+00]	6.0E-01	7.50E-03	2.00E-03	1.7E-03 [4.9E-07]	1.0E-08
GW	Zinc	3.00E-01	3.00E-01	NA	NA	NA	NA	NA	NA
Soil	1,2-Dichlorobenzene	9.00E-02	9.00E-02	4.0E-02 [1.4E-01]	NA	NA	NA	NA	NA
Soil	Acetone	1.00E-01	9.00E-01	NA	NA	NA	NA	NA	NA
Soil	bis(2-ethylhexyl)phthalate	2.00E-02	2.00E-02	NA	NA	1.40E-02	1.40E-02	NA	NA
Soil	Cadmium	1.00E-03	5.00E-04	NA	NA	NA	NA	6.3E+00 [1.8E-03]	1.8E-03
Soil	Carbon disulfide	1.00E-01	1.00E-01	2.9E-03 [1.0E-02]	7.0E-01	NA	NA	NA	NA
Soil	Chromium (VI)	5.00E-03	3.00E-03	NA	1.0E-04	NA	NA	1.4E+01 [1.2E-02]	1.2E-02
Soil	Copper	NA	NA	NA	NA	NA	NA	NA	NA
Soil	Ethylbenzene	1.00E-01	1.00E-01	2.9E-01 [1.0E+00]	1.0E+00	NA	NA	NA	NA
Soil	Lead	NA	NA	NA	NA	NA	NA	NA	NA
Soil	Mercury	3.00E-04	3.00E-04	8.6E-05 [3.0E-04]	NA	NA	NA	NA	NA
Soil	Methyl ethyl ketone (MEK)	6.00E-01	6.00E-01	2.9E-01 [1.0E+00]	5.0E+00	NA	NA	NA	NA
Soil	Methylene chloride	6.00E-02	6.00E-03	8.6E-01 [3.0E+00]	6.0E-01	7.50E-03	2.00E-03	1.7E-03 [4.9E-07]	1.0E-08
Soil	Nickel	2.0E-02	2.0E-02	NA	NA	NA	NA	8.4E-01 [2.4E-04]	NA
Soil	Toluene	2.00E-01	8.00E-01	1.1E-01 [3.9E-01]	5.0E+00	NA	NA	NA	NA
Soil	Xylenes	2.00E+00	2.00E-01	NA	1.0E-01	NA	NA	NA	NA
Soil	Zinc	3.00E-01	3.00E-01	NA	NA	NA	NA	NA	NA

Notes:

EPA - U.S. Environmental Protection Agency
GW - Groundwater
IUR -Inhalation Unit Risk
mg/kg-day - milligrams per kilogram per day
mg/m^3 - milligrams per cubic meter
µg/m^3 - micrograms per cubic meter
NA - not applicable
OU- Operable Unit
RfCi -Inhalation Reference Concentration
RfDo -(oral) Reference Dose
ROD - Record of Decision
SFo -Oral Slope Factor

EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs, in units of (µg/m3)-1, older inhalation toxicity values are converted to IURs for cancer risks using the following formulas: IUR (µg/m3)-1 =[SFi (mg/kg-day)-1 x (20 m3 /day) x (0.001 mg/ug)]/70 kg and RfDi [mg/kg-day] = RfCi [mg/m3] x 20 m3/day÷ 70 kg. Non cancer inhalation reference doses are converted to noncancer hazards. Converted IUR and RfCi values are shown in brackets"[ ]" following the original inhalation toxicity value.

[a] Final ROD, Operable Unit 3 (OU-3) , Tables 5-10 and 5-11 (IT, 1996b)

[b] U.S EPA Integrated Risk Information System (IRIS).http://www.epa.gov/iris/ Accessed September 2015.

7.4 OU-4 (SS016, SS019, SS020, SS021, and SS024)

7.4.1 Electroplating/Chemical Cleaning Shops, Building 1085 (SS016)

The selected remedy was to establish controls in the form of deed restrictions and placement of a VEMUR to restrict the site to non-residential use in the future. (Note: Since the selected remedy, the DEUR process has essentially replaced VEMURs.)

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance***: See discussion of ICs below.
- ***System Operations/O&M:*** Not applicable to this remedy.
- ***Opportunities for Optimization:*** Not applicable to this remedy.
- ***Early Indicators of Potential Remedy Failure:*** None.
- ***Implementation of ICs and Other Measures:*** DEUR was recorded on 16 January 2009 limiting the land use to non-residential, and the deed conveying the property to the PMGAA was entered on 28 January 2009. (Note: The 1998 deed conveying airport property to the PMGAA excluded SS016 and other IRP sites.)

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-4a provides a comparison of the RGs specified at the time of the ROD to current standards. For SS016, the ROD did not specify any chemical-specific ARARs or RGs since an IC alternative was selected. The RGs cited in the RI are provided for comparison to current standards. Current standards are the same or higher than those used for this site, and are therefore protective.
- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review.
- ***Changes in Toxicity and Other Contaminant Characteristics:*** Table 7-4b provides a comparison of the toxicity factors used at the time of the ROD to current factors. The revisions are considered minor and have not resulted in any changes to accepted RGs affecting the protectiveness of this remedy.
- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology apply to these sites.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the current protectiveness of the remedy.

7.4.2 Former Skeet Range at South Desert Village (SS019)

The selected remedy was to remove impacted surface soil and install a protective cap, followed by ICs (i.e., a VEMUR), and compliance with an approved O&M manual. Human habitation of SS019 is allowed in accordance with the ROD, VEMUR, O&M Manual, the Quit Claim Deed between the U.S. Department of Education and ASU, and the Agreement between ADEQ and ASU.

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** The removal action was effective at removal of the top 6 inches of soil contaminated with lead pellets.
- ***System Operations/O&M:*** The O&M period began in 2001 and has been performed semiannually to date. The O&M Manual is in place and is included in the OU-4 ROD.
- ***Opportunities for Optimization:*** None identified.
- ***System Operations/O&M:*** The O&M period began in 2001 and has been performed semiannually to date. The O&M Manual is in place and is included in the OU-4 ROD.
- ***Opportunities for Optimization:*** None identified.
- ***Early Indicators of Potential Remedy Failure:*** No indicators of potential remedy failure were noted during this review.
- ***Implementation of ICs and Other Measures:*** The property was transferred via deed to ASU in February 2001. Deed restrictions pertaining to SS019, the VEMUR, and the ASU-ADEQ O&M agreement concerning the South Desert Village protective soil cap, were all included in the deed.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-4a provides a comparison of the RGs specified at the time of the ROD to the current standard for lead. For SS019, the ROD indicated the RG for lead was based on chemical-specific ARARs. The current standard is the same as that used for this site, and is therefore protective.
- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review.
- ***Changes in Toxicity and Other Contaminant Characteristics:*** No changes in toxicity or other characteristics for lead (the only contaminant at this site) were identified in this review.
- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodologies apply to this remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

7.4.3 Firing Range/Skeet Range (SS020)

The selected remedy was to remove affected soil at the Firing Range and implement ICs (i.e., a VEMUR/DEUR) to prevent residential land use in the future.

Question A: Is the remedy functioning as intended by the decision documents?

- Remedial Action Performance:
  - *Firing Range*: An excavation and disposal action, including backfilling with a protective soil cap, was completed in 1998.
  - *Skeet Range:* No removal actions required.
- ***System Operations/O&M:*** This remedy does not require system operations or O&M for either the Firing Range or the Skeet Range.
- Opportunities for Optimization: None identified.
- Early Indicators of Potential Remedy Failure:
  - *Firing Range:* None.
  - *Skeet Range:* None.
- Implementation of ICs and Other Measures:
  - *Firing Range*: The AF completed the DEUR process on 15 September 2008 which limits the property to non-residential use. The SS020 property was transferred to PMGAA in November 2008 with deed restrictions that prohibit use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years or age, or day care centers for children.
  - *Skeet Range:* The property for the Skeet Range has been transferred via deed to the PMGAA with deed restrictions that prohibit use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years or age, or day care centers for children. A DEUR was recorded on 24 October 2012 which limits the property to non-residential use.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-4a provides a comparison of the RGs specified at the time of the ROD to the current standard for lead. For SS020, the ROD did not specify any chemical-specific ARARs or RGs since an IC alternative was

selected. The RGs cited in the RI are provided for comparison to current standards. The current standard is the same as that used for this site, and is therefore protective.

- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** No changes in toxicity or other characteristics for lead (the only contaminant at this site) were identified in this review.

- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodologies apply to this remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the current protectiveness of the remedy.

7.4.4 Facilities 1030/1051 (SS021)

The selected remedy was to establish controls in the form of deed restrictions and placement of a VEMUR to restrict the site to non-residential use in the future. (Note: Since the selected remedy, the DEUR process has essentially replaced VEMURs.)

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** Not applicable to this remedy.

- ***System Operations/O&M:*** Not applicable to this remedy.

- ***Opportunities for Optimization:*** Not applicable to this remedy.

- ***Early Indicators of Potential Remedy Failure:*** None.

- ***Implementation of ICs and Other Measures:*** A DEUR (equivalent of the VEMUR required in the ROD) was recorded on 20 September 2007 which limits the property to non-residential use. Also in September 2007, the SS021 property was transferred to PMGAA with deed restrictions that prohibit use of the property for residential purposes, hospitals for human care, public or private schools for persons under 18 years or age, or day care centers for children.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-4a provides a comparison of the RGs specified at the time of the ROD to current standards. SS021 has no COPCs.

- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** SS021 has no COPCs.

- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology apply to these sites.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the current protectiveness of the remedy.

7.4.5 Building 1010 (SS024)

The selected remedy was to establish controls in the form of deed restrictions and placement of a VEMUR to restrict the site to non-residential use in the future. (Note: Since the selected remedy, the DEUR process has essentially replaced VEMURs.)

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** Not applicable to this remedy.

- ***System Operations/O&M:*** Not applicable to this remedy.

- ***Opportunities for Optimization:*** Not applicable to this remedy.

- ***Early Indicators of Potential Remedy Failure:*** None.

- ***Implementation of ICs and Other Measures:*** SS024 was transferred to the City of Mesa in 1999 (pre-ROD), but is unoccupied and not used for residential purposes. The overall property including SS024 is fenced and access is controlled. A specific restriction limiting SS024 to non-residential use was not included in the deed, but as discussed in the OU-4 ROD, the conveyance of the property was for the sole purpose of carrying out a specific program (water and wastewater systems, a non-residential use). No other use is allowed by the deed and use of the property for purposes inconsistent with the conveyance could result in the forfeiture of the subject property. The deed specifies that transfer of the property by the City of Mesa may not occur within a 30-year period from the conveyance date without the approval of the AF. Subsequently, a DEUR was recorded by the City of Mesa on 14 April 2015.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-4a provides a comparison of the RGs specified at the time of the ROD to current standards. For SS024, the ROD did not specify any chemical-specific ARARs or RGs since an IC alternative was selected. The RGs cited in the RI are provided for comparison to current standards. Current standards are higher than those used for this site, and are therefore protective.

- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Table 7-4b provides a comparison of the toxicity factors used at the time of the ROD to current factors. The revisions are considered minor and have not resulted in any changes to accepted RGs affecting the protectiveness of this remedy.

- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology apply to these sites.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the current protectiveness of the remedy.

Table 7-4a OU-4: Comparison of ROD Remedial Goals to Current Standards

Site	Media	Chemical of Potential Concern	Units	Range of Detected Concentrations [a]	RG	Basis for RG	Current Standard	Current Standard Citation
SS016	Soil	Arsenic	mg/kg	2.2 - 5.8	0.32 [a,b]	EPA PRG, Residential	10	Arizona Title 18, Chapter 7, Appendix A - SRL (Background)
SS016	Soil	Chromium	mg/kg	11.2 - 106	30 [c]	EPA PRG, Residential	30	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), (Assumed Chromium VI)
SS019	Soil	Lead	mg/kg	> 400 [d]	400 [e]	EPA PRG, Residential and Arizona HBGL	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
SS020	Soil	Lead	mg/kg	12.4 - 5,930	400 [a]	EPA PRG, Residential	400	Arizona Title 18, Chapter 7, Appendix A - SRL (Noncarcinogen, Residential)
SS021	Soil	None	mg/kg	NA	NA	NA	NA	NA
SS024	Soil	alpha-Chlordane	mg/kg	0.78 - 1,000	340 [a]	EPA PRG, Residential	1,900	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), Chlordane
SS024	Soil	Dieldrin	mg/kg	2.3 - 540	28 [a]	EPA PRG, Residential	34	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential)
SS024	Soil	gamma-Chlordane	mg/kg	1.1 - 1,000	340 [a]	EPA PRG, Residential	1,900	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-6} Risk, Residential), Chlordane

Notes:
mg/kg - milligrams per kilogram
10^{-6} - one in one million
EPA - U.S. Environmental Protection Agency.
HBGL - health-based guidance level
mg/kg - milligrams per kilogram
NA - not applicable
OU - operable unit
PRG - preliminary remediation goal
RG - remediation goal
SRL - Soil Remediation Level

[a] Final Remedial Investigation Report, Operable Unit 4 (OU-4) - Table 4-2 (IT, 1997b)
[b] Final Remedial Investigation Report, Operable Unit 4 (OU-4) - Table 4-3 (IT, 1997b)
[c] Based on Chromium VI. Final Remedial Investigation Report, Operable Unit 4 (OU-4) - Table 6-1 (IT, 1997b)
[d] Final Remedial Investigation Report, Operable Unit 4 (OU-4) - Appendix E (IT, 1997b)
[e] Final Record of Decision, Operable Unit 4 (OU-4) - Appendix D (IT, 2000a)

Table 7-4b OU-4: Comparison of ROD Toxicity Factors to Current Values

Site	Site Name	Media	Chemical of Potential Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)		Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
				mg/kg-day		mg/kg-day [mg/m^3]	mg/m^3	$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$ [$\mu g/m^3$]	$\mu g/m^3$
				ROD[a]	Current[b]	ROD[a]	Current[b]	ROD[a]	Current[b]	ROD[a]	Current[b]
SS016	Electroplating / Chemical Cleaning Shops, Building 1085	Soil	Arsenic	3.0E-04	3.0E-04	NA	NA	1.5E+00	1.5E+00	1.5E+01 [4.3E-03]	4.3E-06
SS016	Electroplating / Chemical Cleaning Shops, Building 1086	Soil	Chromium VI	5.0E-03	3.0E-03	NA	1.0E-04	NA	5.0E-01	4.2E+01 [1.2E-02]	1.2E-02
SS019	Former Skeet Range in South Desert Village	Soil	Lead	NA	NA	NA	NA	NA	NA	NA	NA
SS020	Firing Range/Skeet Range	Soil	Lead	NA	NA	NA	NA	NA	NA	NA	NA
SS024	Building 1010	Soil	alpha-Chlordane	6.0E-05	5.0E-04	NA	7.0E-04	1.3E+00	3.5E-01	1.3E+00 [3.7E-04]	1.0E-04
SS024	Building 1010	Soil	Dieldrin	5.0E-05	5.0E-05	NA	NA	1.6E+01	1.6E+01	1.6E+01 [4.6E-03]	4.6E-03
SS024	Building 1010	Soil	gamma-Chlordane	6.0E-05	5.0E-04	NA	7.0E-04	1.3E+00	3.5E-01	1.3E+00 [3.7E-04]	1.0E-04

Notes:
$\mu g/m^3$ - micrograms per cubic meter
EPA - U.S. Environmental Protection Agency
IT - IT Corporation
IUR -Inhalation Unit Risk
mg/kg-day - milligrams per kilogram per day
mg/m^3 - milligrams per cubic meter
NA - not applicable
OU- Operable Unit
RfCi -Inhalation Reference Concentration
RfDo -(oral) Reference Dose
ROD - Record of Decision
SFo -Oral Slope Factor

EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs, in units of (µg/m3)-1, older inhalation toxicity values are converted to IURs for cancer risks using the following formulas: IUR (µg/m3)-1 =[SFi (mg/kg-day)-1 x (20 m3 /day) x (0.001 mg/ug)]/70 kg and RfDi [mg/kg-day] = RfCi [mg/m3] x 20 m3/day ÷ 70 kg. Non cancer inhalation reference doses are converted to noncancer hazards. Converted IUR and RfCi values are shown in brackets"[ ]" following the original inhalation toxicity value.

[a] Final Record of Decision Operable Unit 4 (OU-4) (IT, 2000a), Tables 4-4, 4-5, and 4-6
[b] U.S EPA Integrated Risk Information System (IRIS).http://www.epa.gov/iris/ Accessed September 2015.

7.5 OU-5 (DP028)

The selected remedy for DP028 was incorporated into OU-1. See OU-1 for the technical assessment.

7.6 OU-6 (SS017)

A removal action was implemented to excavate and dispose of dieldrin and PCB-contaminated soil. In addition, the AF has continued monitoring of groundwater. However, a selected remedy was not finalized in a ROD. A Draft Final Amended Proposed Plan (AFRPA, 2015) was issued to the EPA and ADEQ which proposed a selected remedy of NFA for SS017. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017.

Question A: Is the remedy functioning as intended by the decision documents?

- ***Remedial Action Performance:*** The soil removal action was effective in removing PCB-contaminated soil from the site. Soil with dieldrin exceeding the Arizona SRL was effectively removed to a depth of 4 meters bgs.

- ***System Operations/O&M:*** Annual groundwater monitoring has continued to collect information on the dieldrin concentrations at the site.

- ***Opportunities for Optimization:*** None.

- ***Early Indicators of Potential Remedy Failure:*** The groundwater monitoring has continued to detect dieldrin at concentrations greater than the EPA Residential Tap Water RSL (10^{-6} risk) of 0.0018 μg/L (EPA, 2015a).

- ***Implementation of ICs and Other Measures:*** None. Site is fenced and access is controlled. The AF retains ownership of the property.

Question B: Are the assumptions used at the time of remedy selection still valid?

- ***Changes in Standards and TBCs:*** Table 7-5a provides a comparison of the RGs specified at the time the OU-6 FS was prepared and with the current standards (IT, 2000c). Since the OU-6 FS, the EPA has established a drinking water health advisory of 0.2 μg/L based on a 10^{-4} health risk; however, the EPA RSL based on a 10^{-6} cancer risk has decreased to (0.0018 μg/L).

- ***Changes in Exposure Pathways:*** No changes in exposure pathways were identified in this review. The groundwater continues to not be used.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Table 7-5b provides a comparison of the toxicity factors used to current factors. The revisions are considered minor and have not resulted in any changes to accepted RGs affecting the protectiveness of this remedy.

- ***Changes in Risk Assessment Methodologies:*** No changes in risk assessment methodology apply to these sites.

- ***Expected Progress Towards Meeting RAOs:*** No RAOs have been established.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the current protectiveness of the remedy.

Table 7-5a OU-6: Comparison of Remedial Goals to Current Standards

Site Name	Media	Chemical of Potential Concern	Units	Range of Detected Concentrations[a]	RG	Basis for RG	Current Standard	Citation
Old Pesticide/Paint Shop	GW	Dieldrin	µg/L	ND - 0.023	0.0042[a]	EPA PRG	0.0018	EPA Tap Water RSL (November 2015), Carcinogenic Target Risk= 10^{-6}
Old Pesticide/Paint Shop	Soil	Dieldrin	mg/kg	0.001 - 52	0.28[b]	Arizona Residential SRL (10^{-5} Risk)	0.34	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-5} Risk, Residential)
BPW6	Soil	Aroclor 1242	mg/kg	8.5 - 240	2.5[b]	Arizona Residential SRL (10^{-5} Risk)	2.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-5} Risk, Residential)
BPW6	Soil	Aroclor 1248	mg/kg	0.021 - 0.4	2.5[b]	Arizona Residential SRL (10^{-5} Risk)	2.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-5} Risk, Residential)
BPW6	Soil	Aroclor 1254	mg/kg	2.6 - 2.6	2.5[b]	Arizona Residential SRL (10^{-5} Risk)	2.5	Arizona Title 18, Chapter 7, Appendix A - SRL (10^{-5} Risk, Residential)

Notes:

µg/L - micrograms per liter
10^{-5} - one in one hundred thousand
BEM - BEM Systems, Inc.
BPW6 - Base Production Well Number 6
EPA - U.S. Environmental Protection Agency
GW - groundwater
IT - IT Corporation
mg/kg - milligrams per kilogram
ND - not detected
OU - operable unit
PRG - preliminary remediation goal
RG - remediation goal
SRL - Soil Remediation Level

[a] Final Feasibility Study Report, Operable Unit 6 - Appendix C (IT, 2000c)
[b] Final Action Memorandum Spill Site 17 (SS-17) (BEM, 2000)

Table 7-5b OU-6, SS017: Comparison of Toxicity Factors to Current Standards

Site Name	Media	Chemical of Potential Concern	Oral Reference Dose (RfDo)		Inhalation Reference Concentration (RfCi)		Oral Slope Factor (SFo)		Inhalation Unit Risk (IUR)	
			mg/kg-day		mg/m^3	mg/m^3	$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$ [$\mu g/m^3$]	$\mu g/m^3$
			RI[a]	Current[b]	RI[a]	Current[b]	RI[a]	Current[b]	RI[a]	Current[b]
Old Pesticide/Paint Shop	GW	Dieldrin	5.00E-05	5.0E-05	NA	NA	1.60E+01	1.6E+01	1.6E+01 [4.6E-03]	4.6E-03
Old Pesticide/Paint Shop	Soil	Dieldrin	5.00E-05	5.0E-05	NA	NA	1.60E+01	1.6E+01	1.6E+01 [4.6E-03]	4.6E-03
BPW6	Soil	Aroclor 1242	NA	NA	NA	NA	2.00E+00	2.0E+00	2.0E+00 [5.7E-04]	1.0E-04
BPW6	Soil	Aroclor 1248	NA	NA	NA	NA	2.00E+00	2.0E+00	2.0E+00 [5.7E-04]	1.0E-04
BPW6	Soil	Aroclor 1254	NA	2.0E-05	NA	NA	2.00E+00	2.0E+00	2.0E+00 [5.7E-04]	1.0E-04

Notes:
$\mu g/m^3$ - micrograms per cubic meter
BPW6 - Base Production Well Number 6.
EPA - U.S. Environmental Protection Agency.
GW - Groundwater
IT - IT Corporation.
mg/kg - Milligrams per kilogram.
mg/kg-day - Milligrams per kilogram per day.
mg/L - Micrograms per liter.
NA - Not applicable.
OU - Operable Unit.
RI - Remedial Investigation.

EPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). For comparison with newer IURs, in units of (µg/m3)-1, older inhalation toxicity values are converted to IURs for cancer risks using the following formulas: IUR (µg/m3)-1 =[SFi (mg/kg-day)-1 x (20 m3 /day) x (0.001 mg/ug)]/70 kg and RfDi [mg/kg-day] = RfCi [mg/m3] x 20 m3/day ÷ 70 kg. Non cancer inhalation reference doses are converted to noncancer hazards. Converted IUR and RfCi values are shown in brackets"[]" following the original inhalation toxicity value.

[a] Final Remedial Investigation Report, Operable Unit 6 (IT, 1999b), Tables 6-6 and 6-7.
[b] U.S EPA Integrated Risk Information System (IRIS).http://www.epa.gov/iris/ Accessed September 2015.

8.0 ISSUES

Table 8-1 provides the issues identified in this five-year review, including those issues from past five-year reviews that have not been adequately addressed to date.

8.1 OU-1 Remedies

No deficiencies in the remedies for the sites in OU-1 were discovered during the five-year review.

8.2 OU-2 Remedies

The soil RGs specified in the OU-2 ROD and OU-2 ROD Amendment 1 for Site ST012 may not provide long-term protectiveness based on a comparison to current promulgated standards.

Until the deep soil and groundwater remediation is complete, the AF maintains protectiveness by groundwater monitoring and through deed restrictions that control the site and prohibit sensitive uses or installation of drinking water wells.

8.3 OU-3 Remedies

At FT002, the initial RAs implemented did not achieve unrestricted RGs. Issuance and acceptance of a closure report based on the results of additional RAs implemented in 2015 and 2016 is required for the designation of unrestricted use.

A DEUR has been implemented to assure protectiveness and the AF maintains ownership of the property.

8.4 OU-4 Remedies

No deficiencies in the remedies for the sites in OU-4 were discovered during the five-year review.

8.5 OU-5 Remedies

No deficiencies in the remedies for the sites in OU-5 were discovered during the five-year review.

8.6 OU-6 Remedies

Final soil and groundwater remedies for OU-6 sites have not been adopted. At SS017, dieldrin-contaminated soil remains in depths exceeding 4 meters and concentrations of dieldrin in groundwater exceed the November 2015 EPA Resident Tap Water RSL (10^{-6} risk) of 0.0018 µg/L. However, there is no formalized IC or RGs to address this contamination.

The Air Force retains ownership of the site. Site access is currently restricted and there are no unacceptable exposures.

Table 8-1 Identified Issues

OU	Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
OU-2	At ST012, the soil RGs specified in the ROD and ROD Amendment 1 may not provide long-term protectiveness based on a comparison to current standards.	N	Y
OU-3	At FT002, the initial RAs implemented did not achieve unrestricted RGs. A DEUR has been implemented to assure protectiveness and the AF maintains ownership of the property. Issuance and acceptance of a closure report based on the results of additional RAs implemented in 2015 and 2016 is required for removal of the DEUR and designation of unrestricted use.	N	Y
OU-6	Final soil and groundwater remedies for OU-6 sites have not been adopted. 6. At SS017, dieldrin-contaminated soil remains depths exceeding four meters and concentrations of dieldrin in groundwater exceed the November 2015 EPA Resident Tap Water RSL (10^{-6} risk) of 0.0018 µg/L. However, there is no formalized IC or RGs to address this contamination. Site access is currently restricted and there are no unacceptable exposures.	Y	Y

Notes:
µg/L - micrograms per liter
10^{-6} - one in one million
AF - U.S. Air Force
DEUR - Declaration of Environmental Use Restriction
EPA - U.S. Environmental Protection Agency
IC - institutional control
OU- operable unit
RA - remedial action
RG - remediation goal
ROD - Record of Decision
RSL - Regional Screening Level

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Recommendations resulting from this Five-Year Review are as follows:

9.1 OU-2

ST012: Complete an FFS to evaluate remedial alternatives for shallow and deep soils. Based on the FFS, a Proposed Plan and ROD Amendment will be completed to select a long-term soil remedy and to establish standards that will be protective of human health and the environment.

9.2 OU-3

FT002: Issuance and acceptance of a closure report based on the results of additional RAs implemented in 2015 and 2016 is required for removal of the DEUR to meet the establish remedial objectives of the ROD for unrestricted use.

9.3 OU-6

SS017: Complete the OU-6 Amended Proposed Plan and ROD to select the remedy.

Deficiencies, issues, recommended actions, responsible parties, and milestone dates are listed in Table 9-1.

Table 9-1 Recommendations and Follow-Up Actions

OU	Issue or Deficiency	Recommendation/ Follow-up Action(s)	Responsible Agency(ies)	Milestone Date	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
OU-2	ST012. Soil Action Levels specified in the ROD and ROD Amendment 1 no longer considered to be valid.	Preform a soil-specific FFS to determine appropriate long term remedy for soil, finalize decision documents and implement remedy as needed.	AF	CY 2019	N	Y
OU-3	FT002. A DEUR was filed limiting the use of Site FT002 to non-residential uses.	Issuance and acceptance of a closure report based on the results of additional RAs implemented in 2015 and 2016 is required for removal of the DEUR and designation of unrestricted use.	AF	CY 2016	N	Y
OU-6	SS017. Final soil and groundwater remedies for OU-6 sites have not been adopted.	Complete Amended Proposed Plan and ROD for selected remedy.	AF	CY 2017	Y	Y

Notes:

AF - Air Force

CY - calendar year

DEUR - Declaration of Environmental Use Restriction.

FFS - Focused Feasibility Study

OU - operable unit

RA - remedial action

ROD - Record of Decision

10.0 PROTECTIVENESS STATEMENTS

The protection of human health and the environment by the remedies implemented at the former Williams AFB are discussed below. In some cases, the implemented remedies differ from the selected remedy in the ROD. Protectiveness statements relate to the implemented remedy, and any warranted ROD Amendments needed to reconcile differences are indicated.

10.1 OU-1

The remedy at OU-1 is protective of human health and the environment. Implementation of the selected remedy is achieving the primary RG established in the OU-1 ROD of overall protection of human health and the environment by providing a barrier between the contaminated soil and any potential human or environmental receptors. The selected remedy for soil gas and groundwater specified by the OU-1 ROD Amendment is currently being implemented to achieve the established RAOs.

10.2 OU-2

The remedy at OU-2 currently protects human health and the environment because a DEUR, implementing ICs for ST012, was recorded in June 2008 and the current remedy for deep soil and groundwater has been implemented. However, in order for the remedy to be protective in the long-term, a soil-specific FFS is needed to determine appropriate long term remedy for shallow and deep soil based on current standards. Subsequently, decision documents and remedy implementation may be required to ensure protectiveness.

10.3 OU-3

The remedy at OU-3 currently protects human health and the environment because a DEUR, implementing ICs for FT002, was recorded in April 2008. However, in order for the remedy to be protective in the long-term, issuance and acceptance of a closure report documenting RAOs have been achieved is required for removal of the DEUR and of unrestricted use as specified in the OU-3 ROD.

10.4 OU-4

The remedies at OU-4 is protective of human health and the environment. ICs have been implemented in the form of a DEUR or VEMUR at the five OU-4 sites which require land use restriction specified in the OU-4 ROD.

10.5 OU-5

While there were nine sites identified in the OU-5 ROD, only site DP028, the sewage sludge trenches that were addressed under the OU-1 LF004 Landfill cap, triggers the requirement for a five-year review. DP028 is addressed as part of LF004. See OU-1 protectiveness statement.

10.6 OU-6

A protectiveness determination of the remedy at OU-6 cannot be made at this time until soil and groundwater remedies have been determined by finalization of a ROD. The EPA and ADEQ dispute AF's technical justification for proposing to select an NFA remedy for SS017. The dispute resolution is expected to be finalized in May 2016. Subsequently, completion of an amended proposed plan and ROD it is expected to complete in 2017, at which time a protectiveness determination will be made.

11.0 NEXT REVIEW

The five-year review process at the former Williams AFB is a statutory requirement that requires ongoing five-year reviews. The next review will be conducted within five years of the completion of this Five-Year Review report. The completion date is the date of the signature shown on the concurrence cover attached to the front of the report.

12.0 REFERENCES

General:

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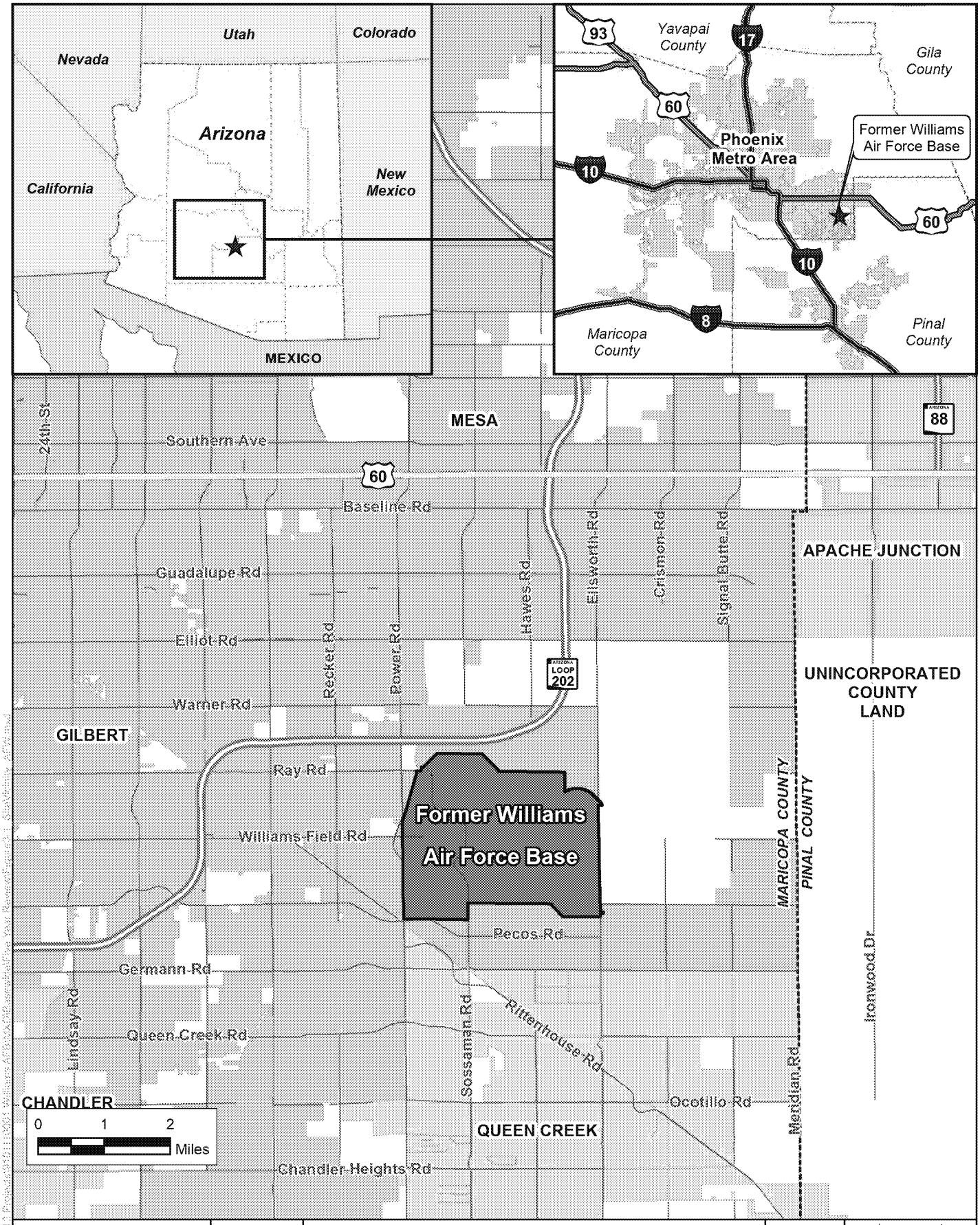
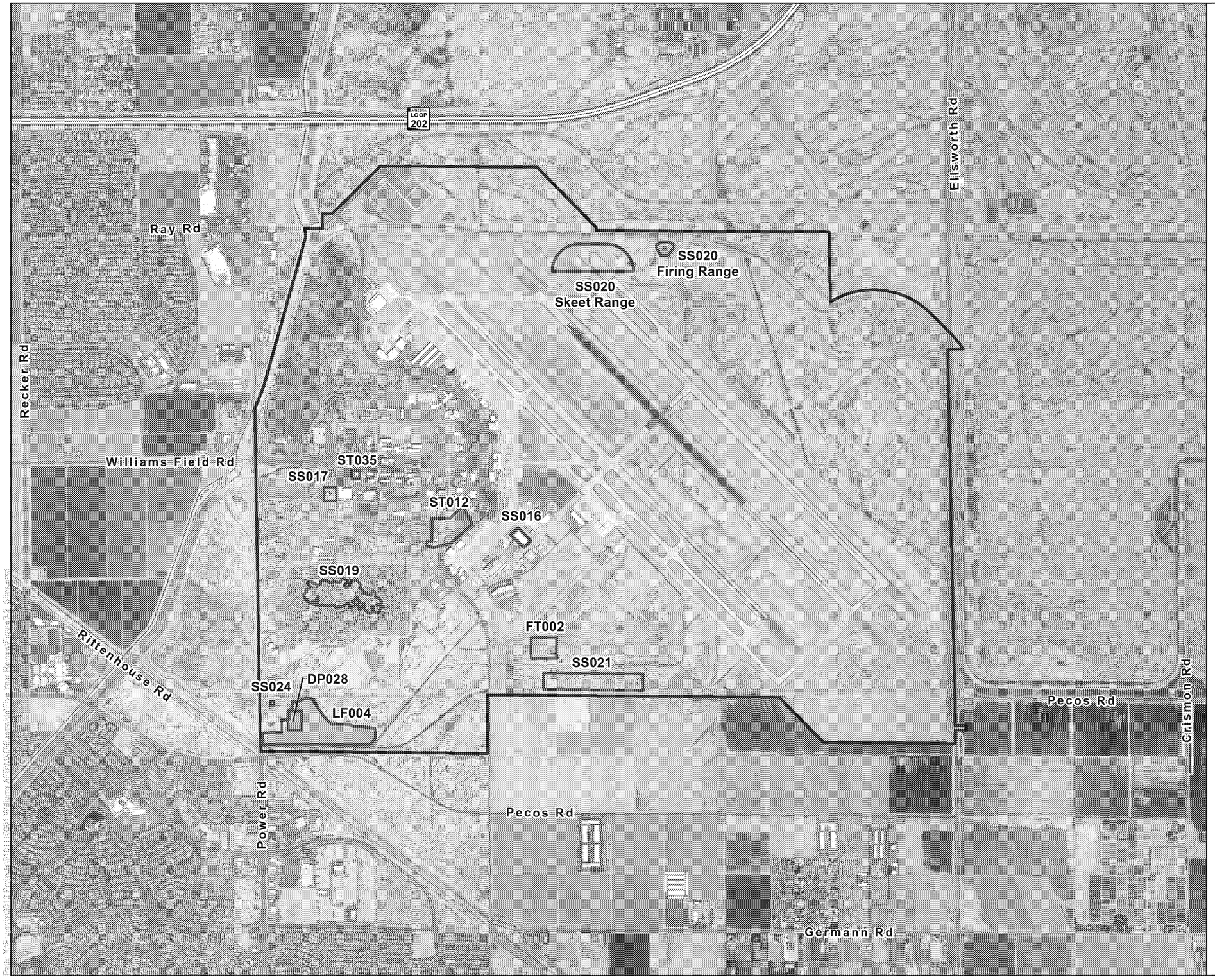
FIGURES



Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 2 miles	N	**Location of Former Williams Air Force Base**	FIGURE **3-1**	U.S. AIR FORCE



Legend

- Site Location
- Former Williams AFB Boundary

N

Site Location Map

FIGURE **3-2**	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 2200'	U.S. AIR FORCE

0 550 1,100 2,200 Feet

Five Year Review
Former Williams AFB, Mesa, AZ

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April 2016

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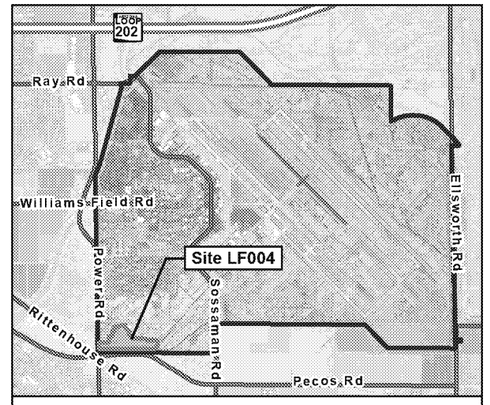


Area of Detail

Legend

- Monitoring Well Location (groundwater samples and depth to groundwater measurements)
- Monitoring Well Location (depth to groundwater measurements only)
- Observation Well Location (depth to groundwater measurements only)
- LF004 Boundary
- Former Williams AFB Boundary

Notes:

LF01-W11M Well Identification

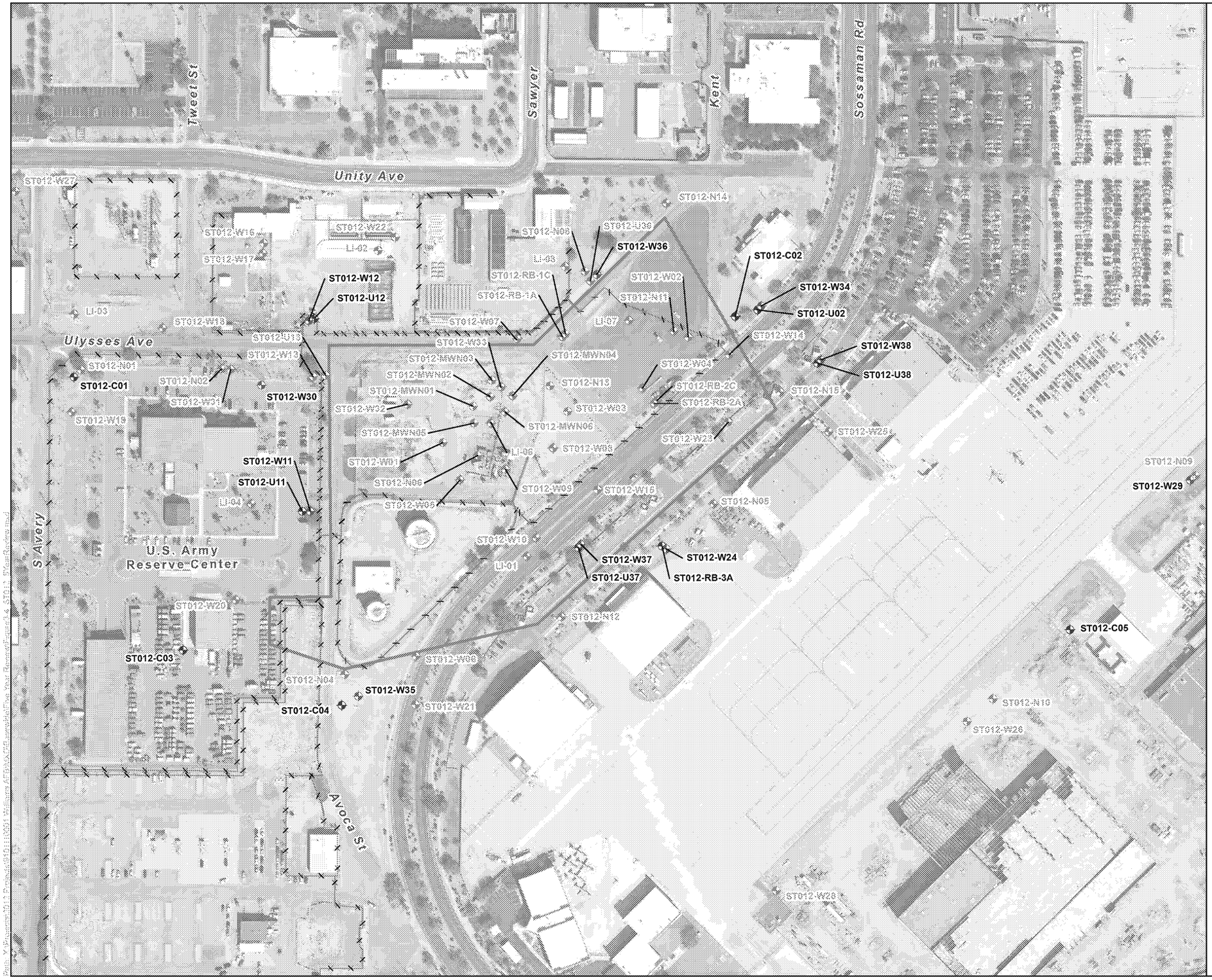
N

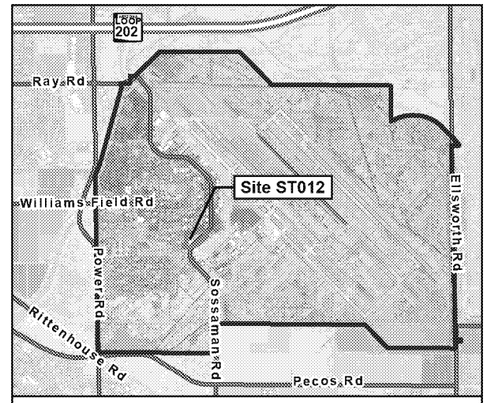
LF004 Site Map

FIGURE	Job No.:	9101110001
3-3	PM:	DS
	Date:	4/6/2016
	Scale:	1" = 400'

0 100 200 400 Feet

U.S. AIR FORCE





Area of Detail

Legend

- Groundwater Monitoring Well Location Screened in the UWBZ/CZ
- Groundwater Monitoring Well Location Screened in the LSZ
- Decommissioned Groundwater Monitoring Well Location
- Fenceline
- ST012 Boundary

Notes:

ST012-RB-3A	Monitoring Well Identification
ST012-W25	Decommissioned Monitoring Well Identification
LSZ	Lower Saturated Zone
UWBZ/CZ	Upper Water Bearing Zone/Cobble Zone

N

ST012 Site Map

FIGURE **3-4**	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 200'	U.S. AIR FORCE

0 50 100 200 Feet

Five Year Review
Former Williams AFB, Mesa, AZ

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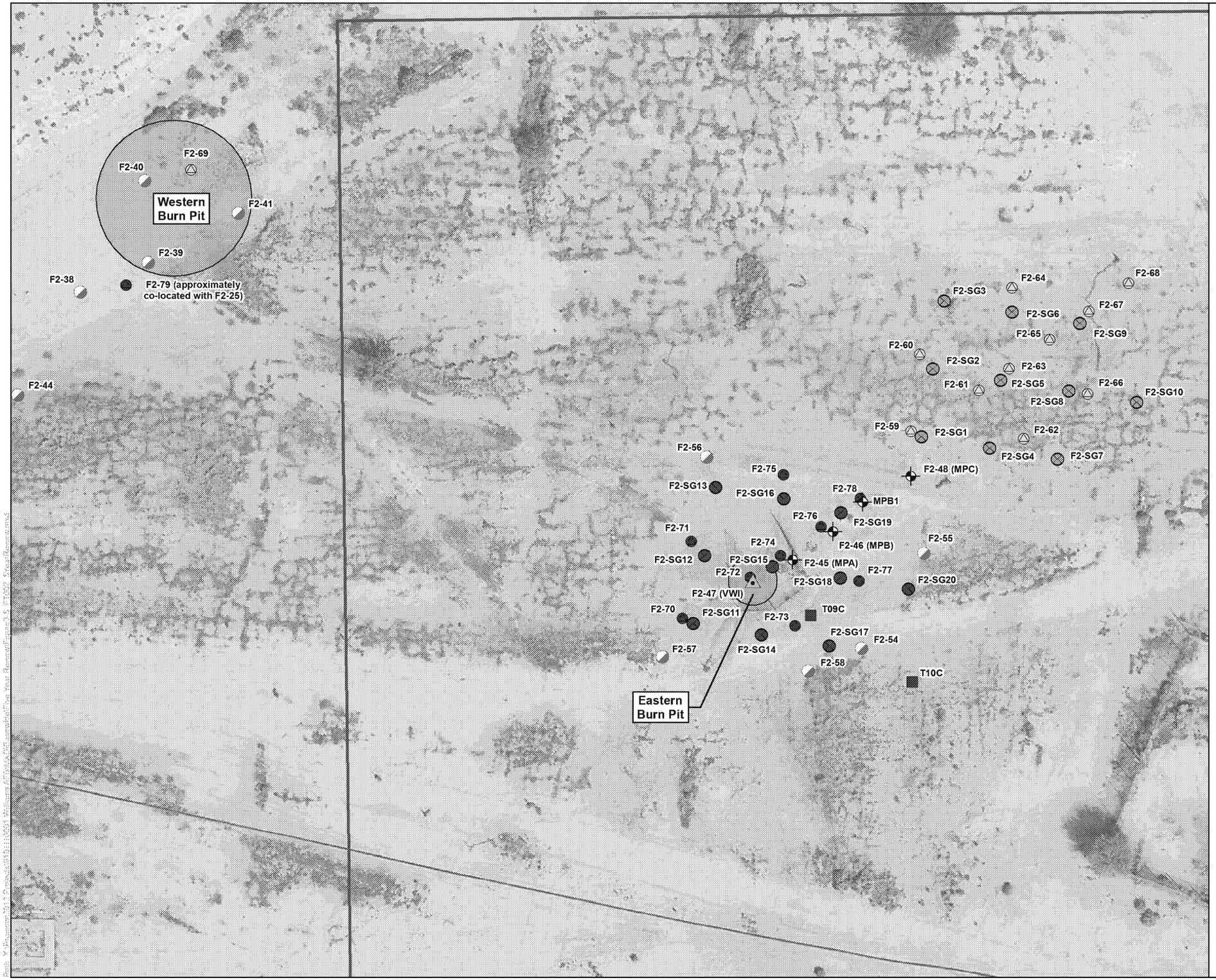
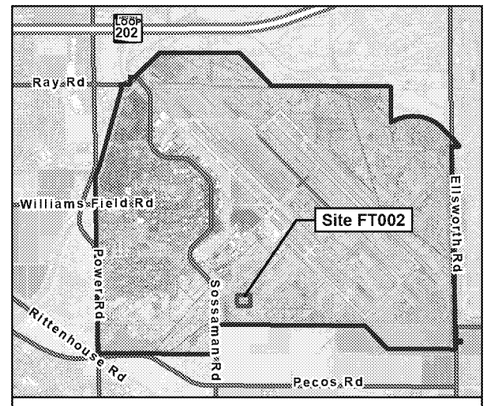




Area of Detail

Legend

Recent Sample Locations

- Soil Gas Sample Location (June 2013)
- Soil Gas Sample Location (January 2013)
- Soil Sample Location (June 2013)
- Soil Sample Location (January 2013)

Historic Sample Locations

- Characterization Confirmation Borehole
- Soil Organic Vapor Sample Location
- Monitoring Point
- Existing Vent Well Location (Abandoned)
- Approximate Location of Former Burn Pit
- FT002 Boundary

Notes:

F2-68 Sample Location Identification

N

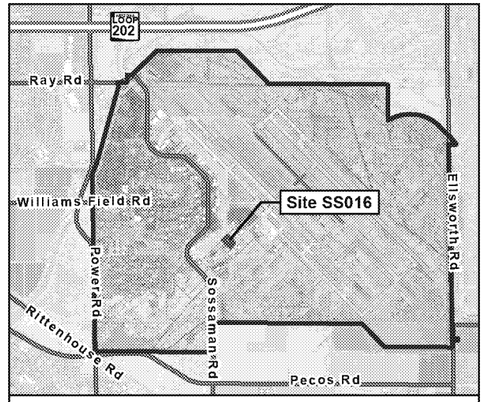
FT002 Site Map

FIGURE **3-5**

Job No.:	9101110001
PM:	DS
Date:	4/6/2016
Scale:	1" = 40'

0 10 20 40 Feet

U.S. AIR FORCE



Area of Detail

Legend

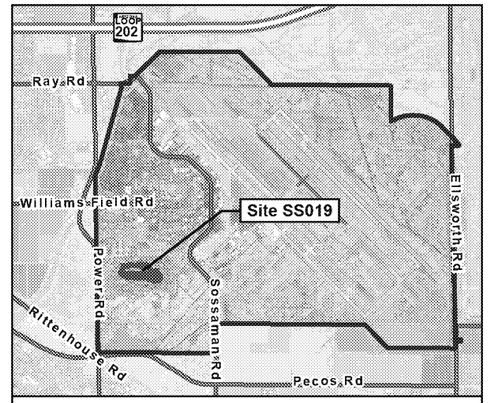
SS016 Boundary

N

SS016 Site Map

FIGURE 3-6	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 100'	U.S. AIR FORCE

0 25 50 100 Feet



Area of Detail

Legend

SS019 Boundary

N

SS019 Site Map

FIGURE 3-7	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 200'	U.S. AIR FORCE

0 50 100 200 Feet

Five Year Review
Former Williams AFB, Mesa, AZ

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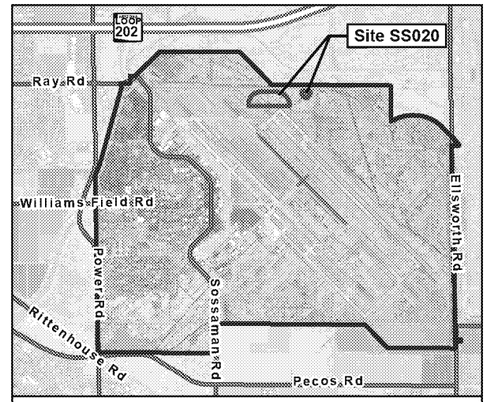


Area of Detail

Legend

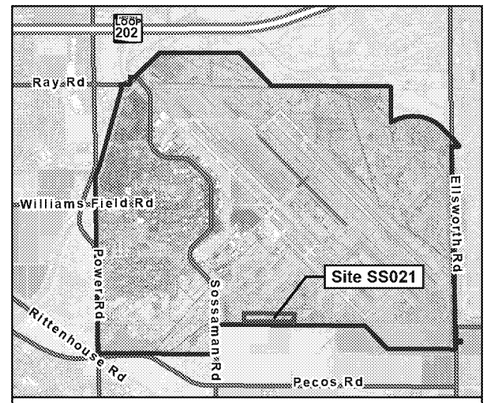
- SS020 Boundary
- Former Williams AFB Boundary

N

SS020 Site Map

FIGURE 3-8	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 200'	U.S. AIR FORCE

0 75 150 300 Feet



Area of Detail

Legend

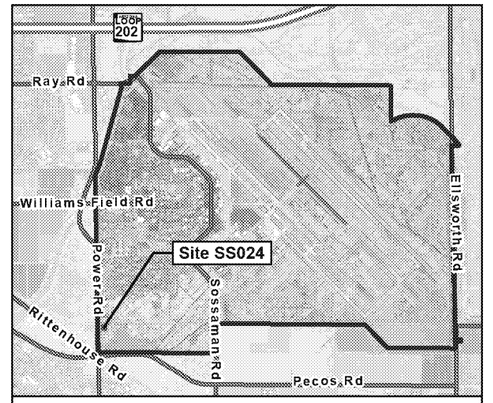
- SS021 Boundary
- Former Williams AFB Boundary

N

SS021 Site Map

FIGURE 3-9	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 200'	U.S. AIR FORCE

0 50 100 200 Feet



Area of Detail

Legend

- SS024 Boundary
- Former Williams AFB Boundary

N

SS024 Site Map

FIGURE 3-10	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 50'	U.S. AIR FORCE

0 25 50 Feet

Five Year Review
Former Williams AFB, Mesa, AZ

Working Copy
April 2016

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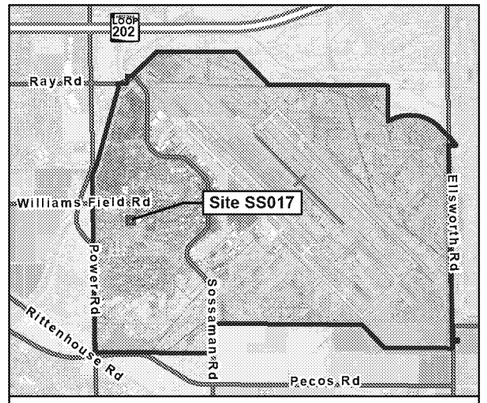

Area of Detail

Legend

- Groundwater Monitoring Well Location
- Razed Building Location
- SS017 Boundary

Notes:

SS017-MW02	Monitoring Well Identification
***B760-MW14**	Monitoring Well belongs with the Site ST035 (Former Building 760) (ST035) groundwater monitoring program

N

SS017 Site Map

FIGURE **3-11**	Job No.: 9101110001 PM: DS Date: 4/6/2016 Scale: 1" = 60'	U.S. AIR FORCE
0 15 30 60 Feet		

APPENDIX A

PHOTO DOCUMENTATION OF SITE INSPECTIONS IN JANUARY 2016

Photo 1. OU-1, LF004 – Fence Signage (English and Spanish)

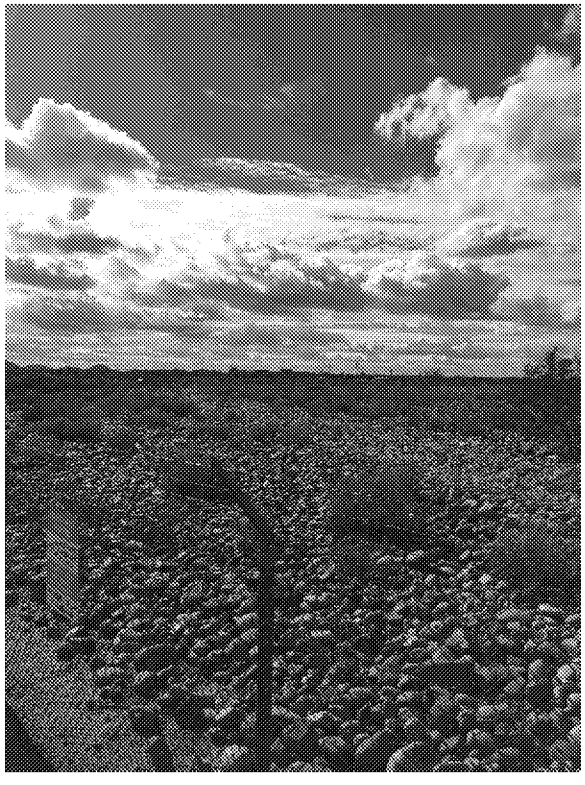

Photo 2. OU-1, LF004 – Capped Area (Typical)

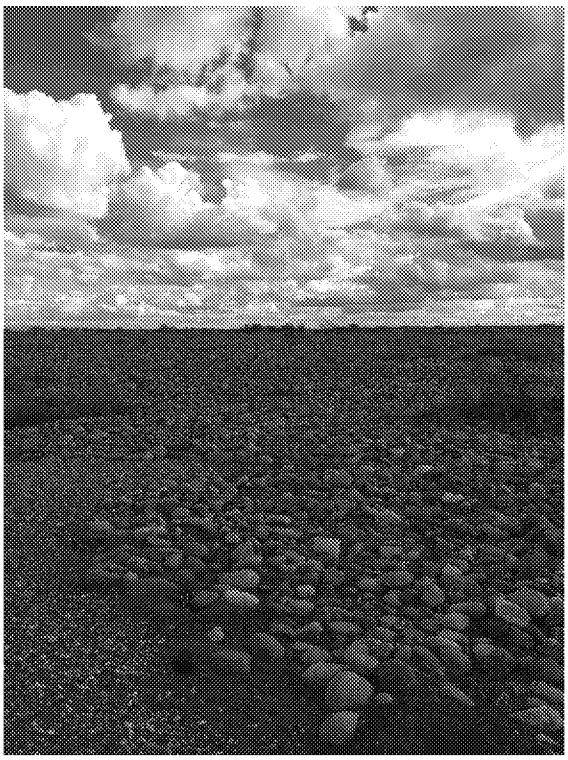

Photo 3. OU-1, LF004 – Capped Area (Typical)

Photo 4. OU1, LF004 – Aboveground Storage Tank (AST) Soil Vapor Extraction (SVE) System and LF01-W17 In-Well Air Stripping (IWAS) System

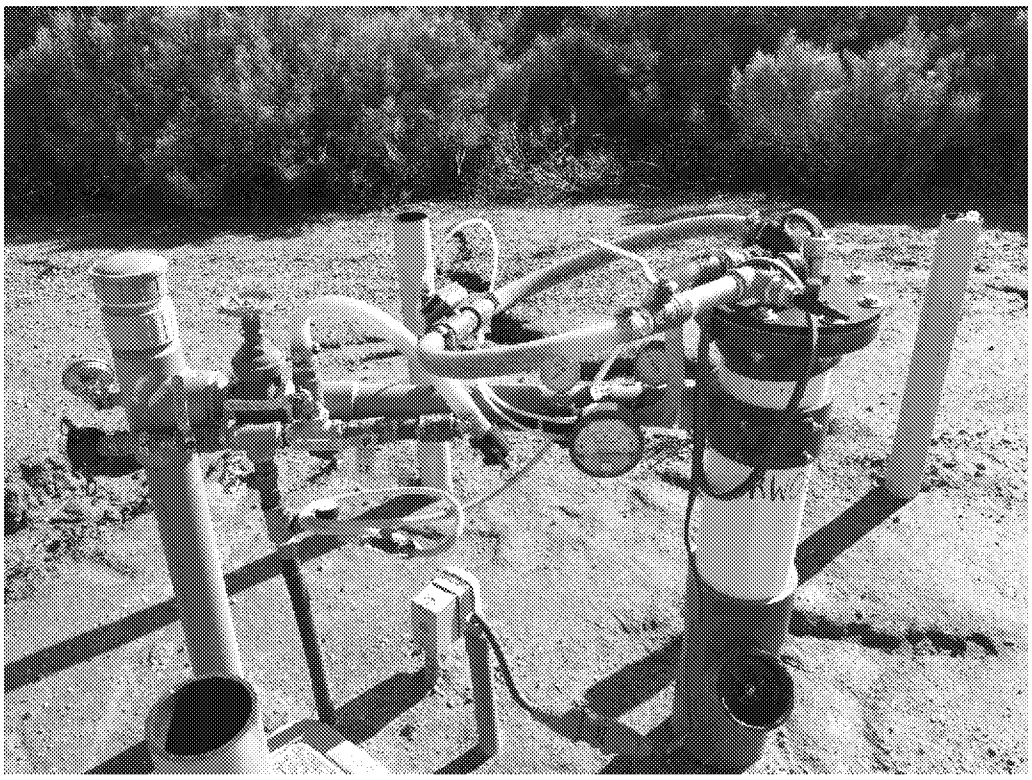

Photo 5. OU1, LF004 – IWAS Remediation Well

Photo 6. OU-1, LF004 – Above-grade completion monitoring wells

Photo 7. OU-1, LF004 – Southeast (SE) Landfill Soil Vapor Extraction Skid

Photo 8. OU-1, LF004 – LF-01-W19 Oxidant Injection Area

Photo 9. OU-1, LF004 – Flush-grade completion monitoring well (typical)

Photo 10. OU-2, ST012 – Fence Signage

Photo 11. OU-2, ST012 – Steam Enhanced Extraction (SEE) System (facing south)

Photo 12. OU-2, ST012 – SEE System (facing southwest)

Photo 13. OU-2, ST012 – SEE System (facing northeast)

Photo 14. OU-2, ST012 – SEE System Well Manifold Piping

Photo 15. OU-2, ST012 – SEE System Multi-Phase Extraction Well

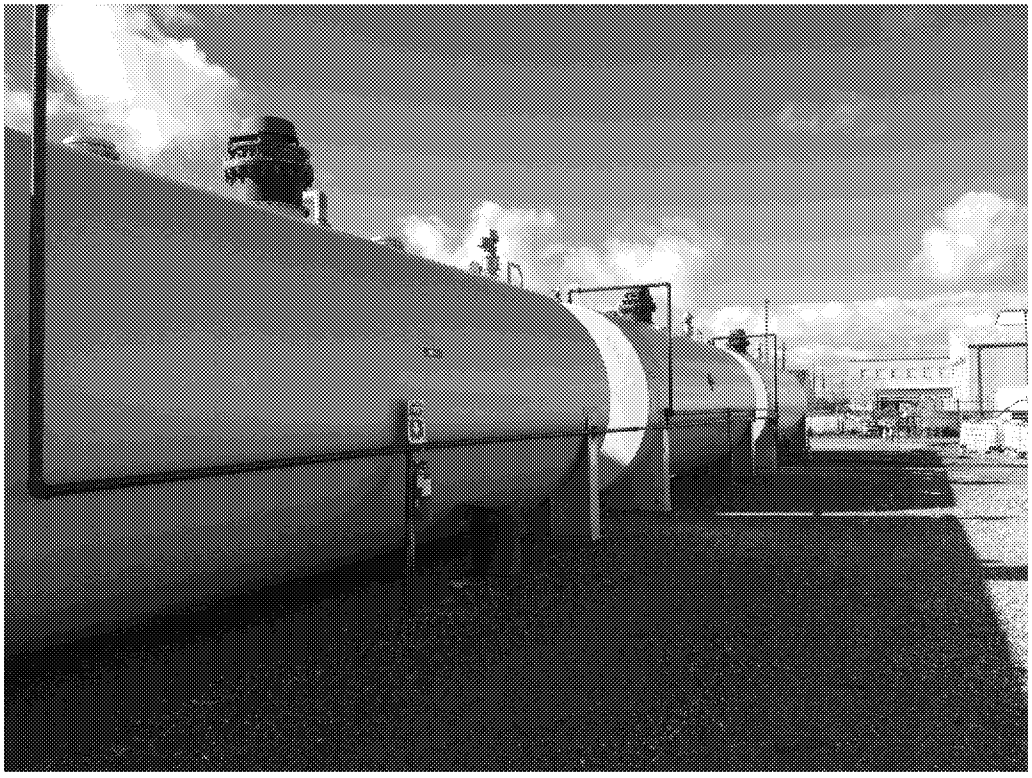

Photo 16. OU-2, ST012 – SEE System Non-Aqueous Phase Liquids (NAPL) Storage Tanks

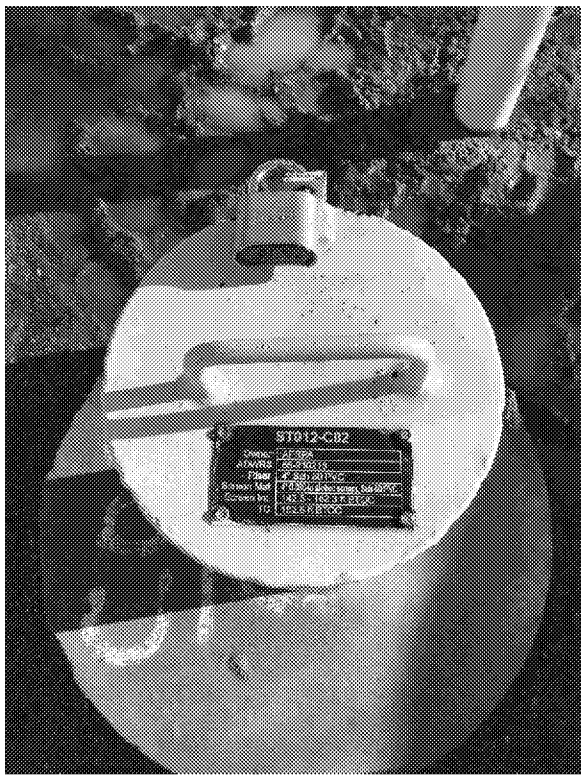

Photo 17. OU-2, ST012 – Above-grade completion monitoring well (typical)

Photo 18. OU-2, ST012 – Flush-grade completion monitoring well (typical)

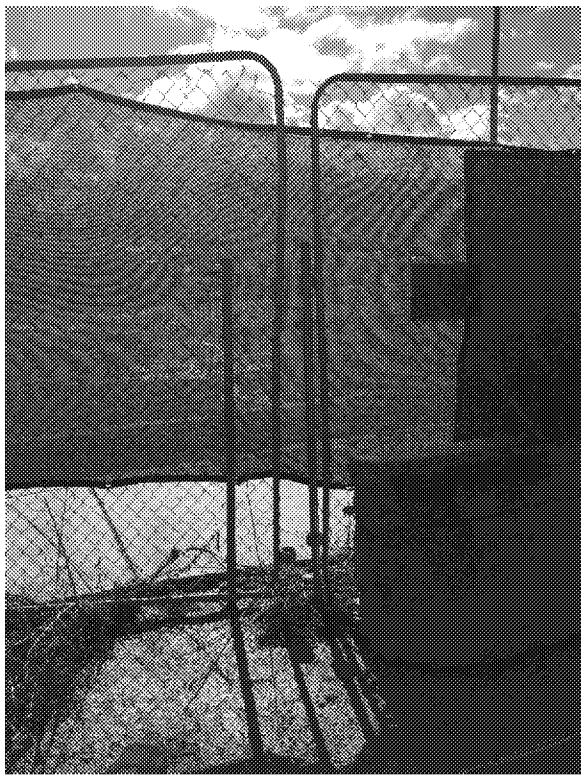

Photo 19. OU-2, ST012 – Separation in perimeter fencing along eastern portion of the site

Photo 20. OU-3, FT002 – Fire Protection Training Area No. 2 (facing east)

Photo 21. OU-3, FT002 – Fire Protection Training Area No. 2 (facing east)

Photo 22. OU-4, SS016 – Electroplating/Chemical Cleaning Shop (Building 1085)

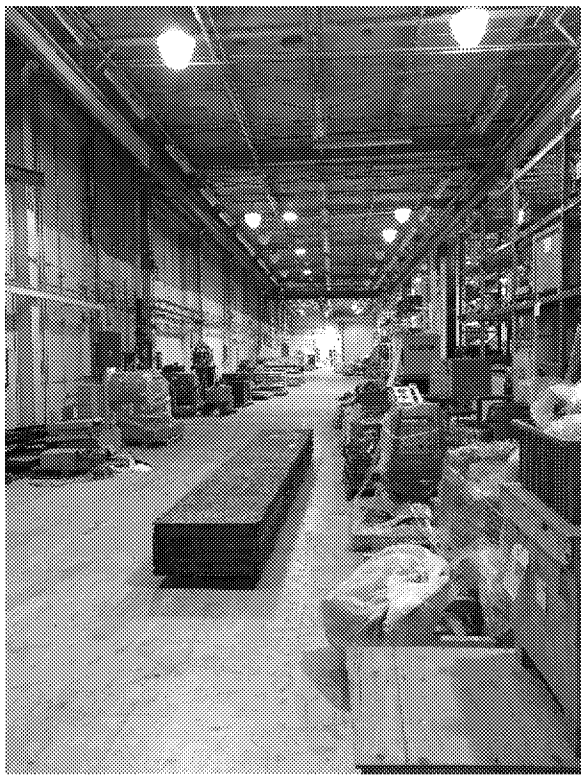

Photo 23. OU-4, SS016 – Building 1085 Interior

Photo 24. OU-4, SS016 – Building 1085 Interior

Photo 25. OU-4, SS019 – South Desert Village Entrance

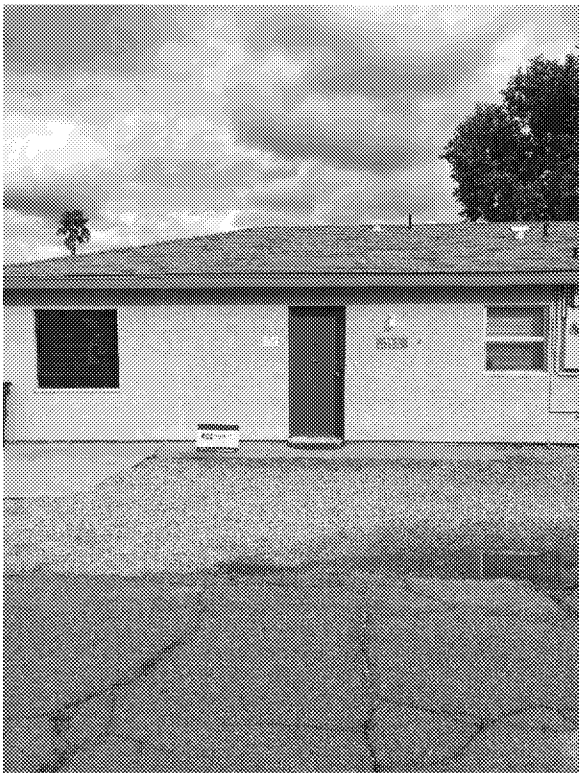

Photo 26. OU-4, SS019 – Residence located within the Protective Cap Area (typical)

Photo 27. OU-4, SS019 – Signage at residence located within the Protective Cap Area (typical)

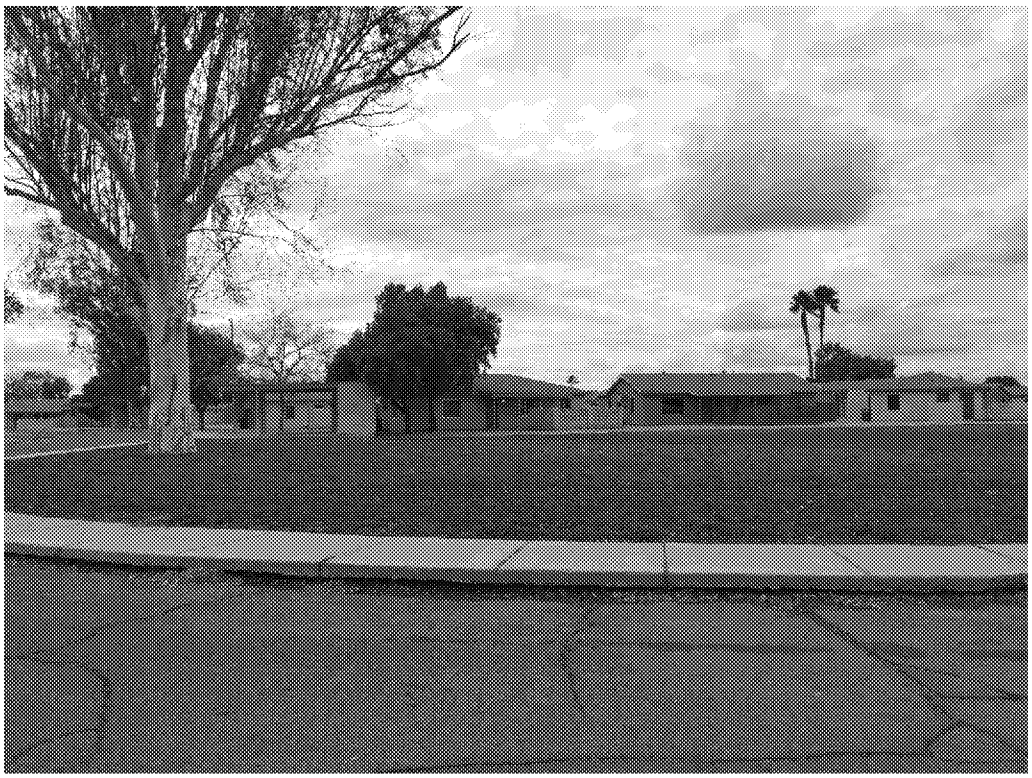

Photo 28. OU-4, SS019 – Open area located within the Protective Cap Area (typical)

Photo 29. OU-4, SS019 – Signage at open area located within the Protective Cap Area (typical)

Photo 30. OU-4, SS020 – Former Firing Range

Photo 31. OU-4, SS020 – Former Skeet Range

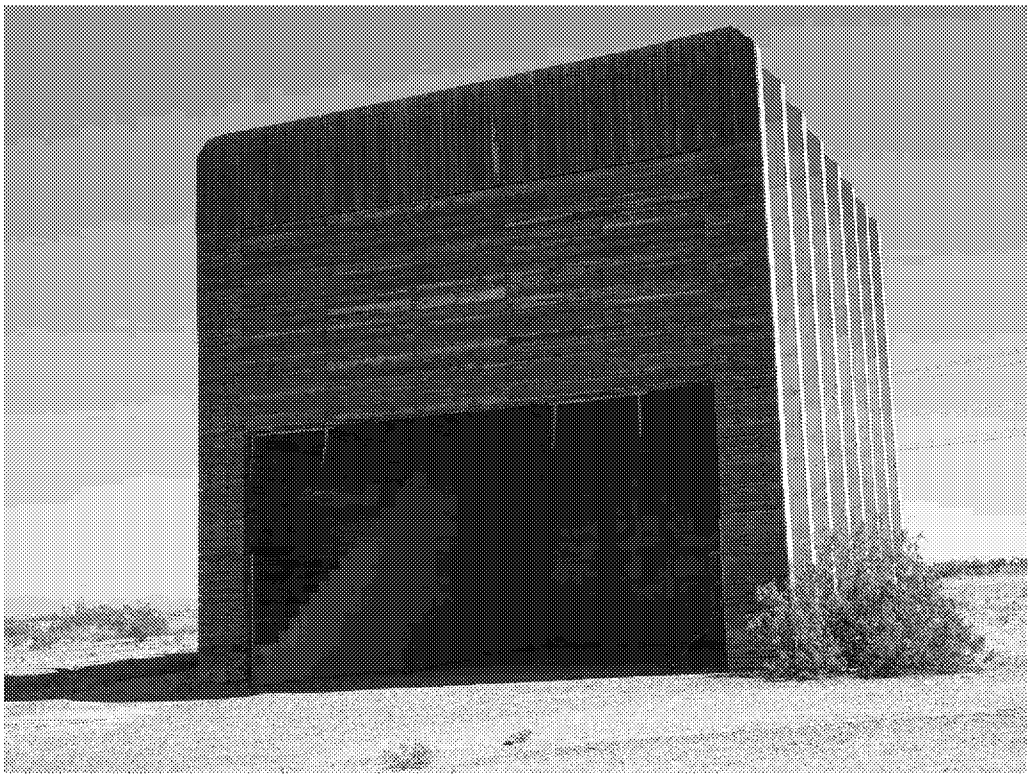

Photo 32. OU-4, SS021 – Facility 1051

Photo 33. OU-4, SS021 – Facility 1020

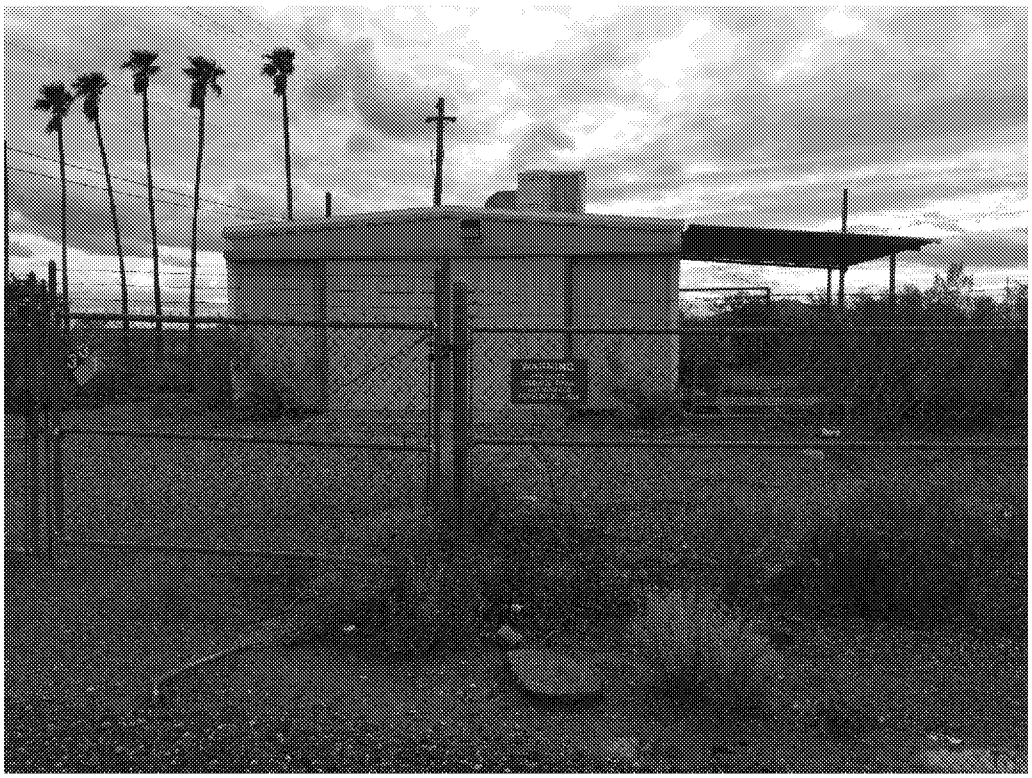

Photo 34. OU-4, SS024 – Building 1010 and Fence Signage

Photo 35. OU-4, SS024 – West facing fence signage overgrowth

Photo 36. OU-4, SS024 – Barbed wire fencing damage on northeast corner

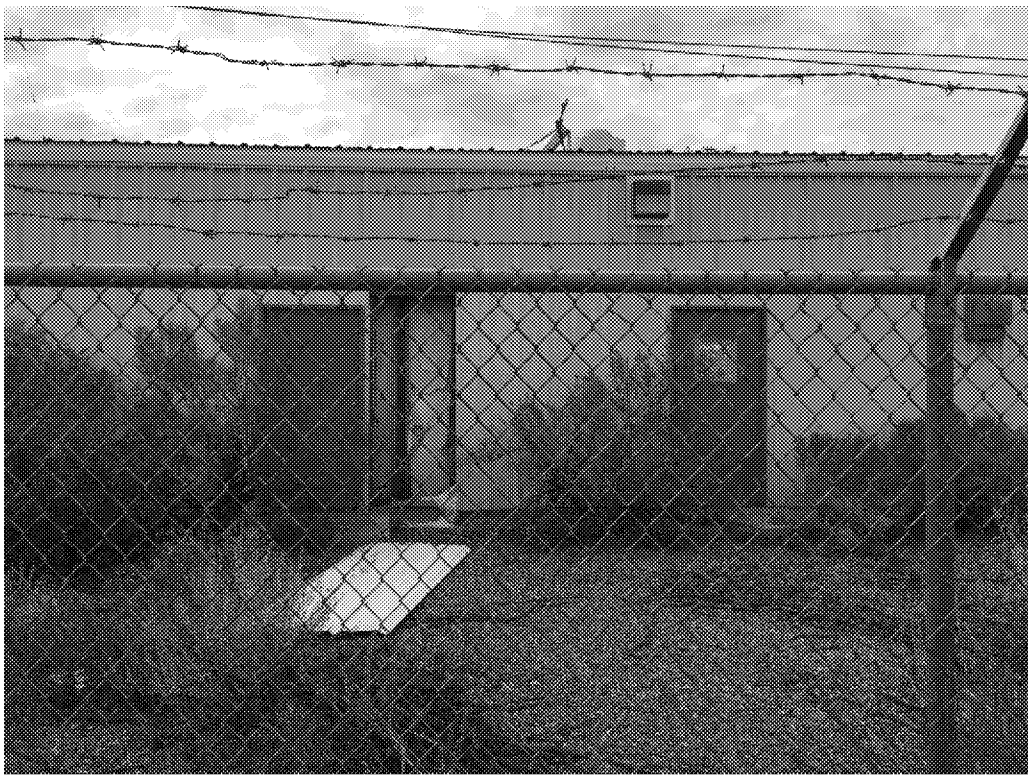

Photo 37. OU-4, SS024 – Damaged wall panel on east side of Building 1010

Photo 38. OU-4, SS024 – Building 1010 secured perimeter gate

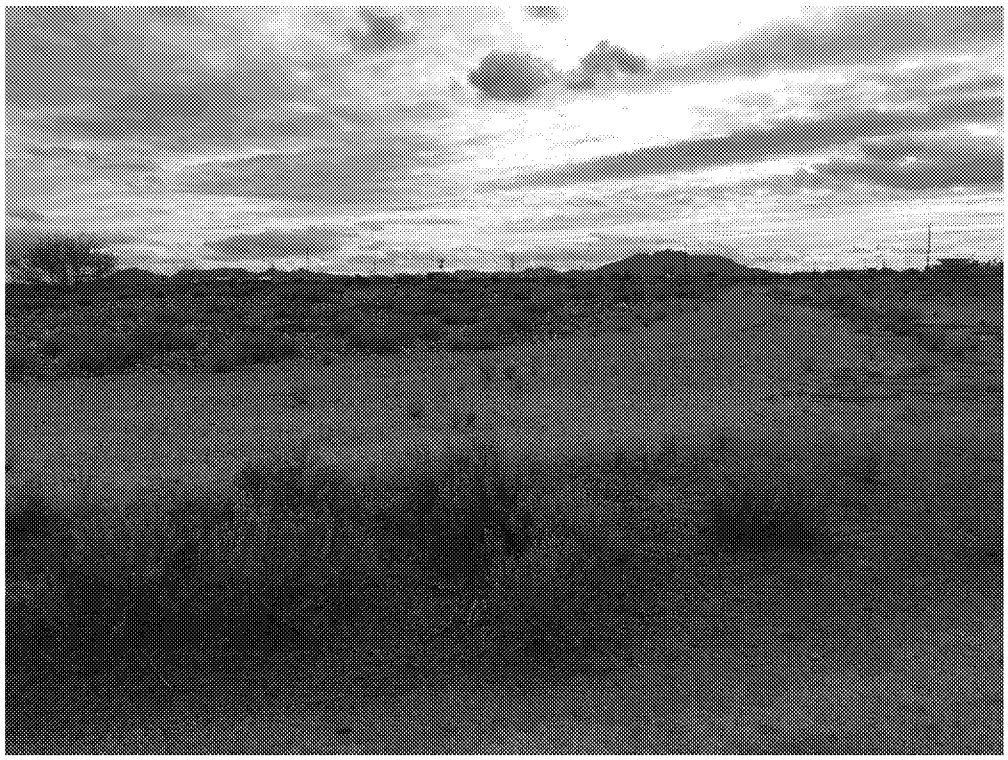

Photo 39. OU-5, DP028 – Sewage Sludge Trenches, capped as part of OU1 - LF004 remedy

Photo 40. OU-6, SS017 – Secured gate and signage

Photo 41. OU-6, SS017 – Site area (facing north)

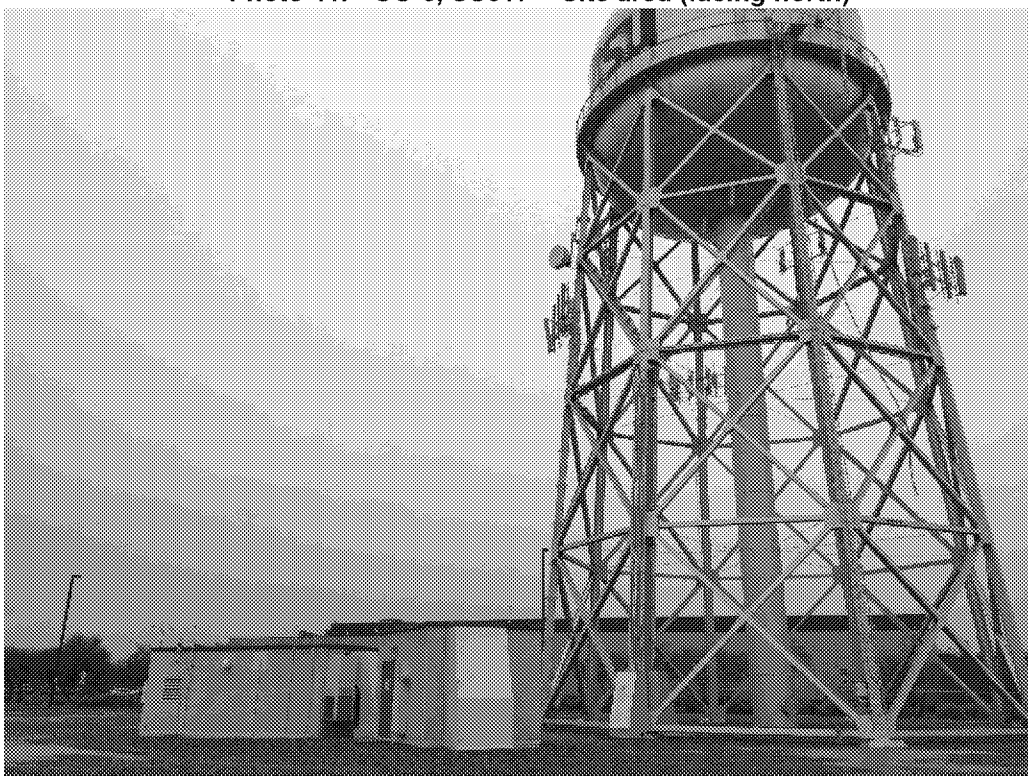

Photo 42. OU-6, SS017 – On site building and Water Tower

Photo 43. OU-6, SS017 – Site area (facing west)

Photo 44. OU-6, SS017 – Above-grade completion monitoring well (typical)

Photo 45. OU-6, SS017 – Flush-grade completion monitoring well (typical)

APPENDIX B

LAND USE CONTROL/INSTITUTIONAL CONTROL INSPECTION CHECKLISTS

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-1 – Landfill 004 (LF004) /OU-5 Sewage Sludge Trenches (DP028)

Date of inspection: January 6, 2016

Weather/Temperature: Rain/Overcast 50°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ● Landfill cover/containment
- ● Access controls
- ● Land development controls
- ● Facility development controls
- ● Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ○ Excavation controls
- ● Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing

1. **Fencing** ● Undamaged ○ Location shown on site map ● Gates secured ○ No
   Remarks Site access is restricted by a perimeter fence and locked gates.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks No trespassing or hunting allowed (English and Spanish) signs placed on fence and soil vapor treatment system compound are locked when field technician is not on site.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual Landfill Inspection and Maintenance Report
   Responsible party/agency Air Force Civil Engineer Center /Amec Foster Wheeler
   Contact Catherine Jerrard, PE (Name) BRAC Environmental Coordinator (Title) 315-356-0810 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached (See "Final Annual Landfill Inspection and Maintenance Report September and October 2014 Events, Site LF004, Former Williams Air Force Base, Mesa, Arizona" – June 2015)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
Remarks

2. **Land use changes on site** ○ Yes ● No
Remarks

3. **Land use changes off site** ○ Yes ● No
Remarks

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition

1. **Landfill cap damaged** ○ Location shown on site map ● No ● Roads adequate
Remarks: The landfill cap is in good condition and has maintained its integrity. Minor fissures, cracks, and animal burrows or holes. The interceptor trenches and drainage grates are in good condition. The access roads on the landfill and Old Pecos Road are in serviceable condition; erosion in the southern site boundary road was repaired. • The retaining wall along the Rittenhouse Channel south of the landfill is in good condition.

B. Other Site Conditions

Remarks Remedy components associated with SVE and IWAS the operating remedies for soil vapor and groundwater were intact and operable. Operations and maintenance, system monitoring, and health and safety documents are available on request.

C. Monitoring Well Condition

1. **Monitoring Wells**
● Properly secured/locked ● Functioning ● Routinely sampled
● Good condition ● All site wells located ○ Needs Maintenance
○ N/A

Remarks All wells are sampled and inspected semiannually and repaired if needed.

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

Use of the LF004 capped area for residential purposes, hospitals for human care, public or private schools for persons under 18 years of age, or day-care centers for children is prohibited to limit sensitive receptor exposure to contaminated surface soils. · Installation of groundwater wells or extraction of groundwater from the property for any purpose other than remediation or monitoring is prohibited to prevent use of groundwater for consumption or irrigation. · Structures intended for occupancy within areas impacted by COCs in shallow soil gas will be (a) designed and constructed in a manner that would mitigate unacceptable risk under CERCLA and the NCP (e.g., through installation of a vapor intrusion barrier or gas collection system); or (b) evaluated for the potential for unacceptable risk prior to the erection of any new occupied structure in the same area, and mitigated for vapor intrusion in the design/construction of the structure prior to occupancy if an unacceptable risk is posed under CERCLA and the NCP.. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-2 – Former Liquid Fuels Storage Area (ST012)

Date of inspection: January 6, 2016

Weather/Temperature: Rain/Overcast 50°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ● Access controls
- ● Land development controls
- ● Facility development controls
- ● Well installation restrictions
- ○ Other_____
- ● Groundwater discharge controls
- ● Excavation controls
- ● Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing

1. **Fencing** ○ Undamaged ○ Location shown on site map ● Gates secured ○ No
   Remarks Site access is restricted by a perimeter fence and locked gates when operators are not on site. One separation in the eastern perimeter fence was noted during this inspection. No unauthorized access has been recorded See Photo 19 of Appendix A.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks Signs are posted on perimeter fence. Contact and project information posted at main access gate (west gate).

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency Phoenix-Mesa Gateway Airport Authority
   Contact Chad A. Willis (Name) Environmental & Archaeological Coordinator (Title) 480-988-7612 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached See 2015 Institutional Control Annual Status Reports for the Declaration of Environmental Use Restriction (DEUR) Sites located at the Phoenix-Mesa Gateway Airport (SS016, SS020 [Firing Range and Skeet Range], SS021, and ST012)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks

2. **Land use changes on site** ○ Yes ● No
   Remarks

3. **Land use changes off site** ○ Yes ● No
   Remarks

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ○ Roads adequate
   Remarks:

B. Other Site Conditions

Remarks Remedy components associated with SEE treatment and SVE operating remedies for soil vapor and groundwater were intact and operable. Operations and maintenance, system monitoring, and health and safety documents are available on request. City of Mesa wastewater discharge permits are applicable to the groundwater treatment and available upon request. SEE treatment system components including the steam injection wells and dual-phase extraction wells were generally in operable condition. At the time of the inspection the steam generation system was offline for maintenance.

C. Monitoring Well Condition

1. **Monitoring Wells**
   ○ Properly secured/locked ● Functioning ● Routinely sampled
   ● Good condition ● All site wells located ○ Needs Maintenance
   ○ N/A

Remarks Monitoring wells are sampled and inspected annually and repaired if needed. Monitoring wells outside the secured perimeter fence are not secured with locking vaults or caps; however, the wells contain equipment which may prohibit the use of locking caps. The wells are used for monitoring of the currently operating remedy and are routinely inspected.

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes is prohibited to limit sensitive receptor exposure to contaminated media. ICs prohibit the installation of wells or extraction of groundwater except for remediation and/or monitoring to prevent use of groundwater for consumption or irrigation. ICs limit soil excavation to 10 ft in depth at the site to prevent exposure to contaminated sub surface soils. LUC/ICs are properly implemented and no violations were noted. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-3 – Fire Training Area (FT002)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ○ Access controls
- ● Land development controls
- ● Facility development controls
- ● Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ● Excavation controls
- ● Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing

1. **Fencing** ● Undamaged ○ Location shown on site map ● Gates secured ● No
   Remarks There are no fences which limit access to the site; however; fencing protects remediation and electrical equipment formerly used for remediation at the site.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ● No
   Remarks None

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency Air Force Civil Engineer Center
   Contact Catherine Jerrard, PE (Name) BRAC Environmental Coordinator (Title) 315-356-0810 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached (See the Declaration of Environmental Use Restriction (DEUR) Annual Report for 2015, former Williams Air Force Base)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks_____

2. **Land use changes on site** ○ Yes ● No
   Remarks_____

3. **Land use changes off site** ○ Yes ● No
   Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ○ Roads adequate
   Remarks: _____

B. Other Site Conditions

Remarks At the time of the inspection no remediation activities were being conducted. Some remedy components remained intact.

C. Monitoring Well Condition

1. **Monitoring Wells**
   - ● Properly secured/locked
   - ○ Functioning
   - ○ Routinely sampled
   - ● Good condition
   - ● All site wells located
   - ○ Needs Maintenance
   - ○ N/A

   Remarks At the time of the inspection only one soil vapor well is located on the site. The soil vapor well is not in use and is located within the perimeter of the secured fence on site.

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

To protect the public health and the environment, ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes and if excavated at or below five feet bgs, be handled, stored, transported, and tested in accordance with disposal requirements for chemically contaminated materials. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-4 – Building 1085 Electroplating/Chemical Cleaning Shop (SS016)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ○ Access controls
- ● Land development controls
- ● Facility development controls
- ○ Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ○ Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing ● N/A

1. **Fencing** ○ Undamaged ○ Location shown on site map ○ Gates secured ○ No
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency Phoenix-Mesa Gateway Airport Authority
   Contact Chad A. Willis (Name) Environmental & Archaeological Coordinator (Title) 480-988-7612 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached See 2015 Institutional Control Annual Status Reports for the Declaration of Environmental Use Restriction (DEUR) Sites located at the Phoenix-Mesa Gateway Airport (SS016, SS020 [Firing Range and Skeet Range], SS021, and ST012)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks_____

2. **Land use changes on site** ○ Yes ● No
   Remarks_____

3. **Land use changes off site** ○ Yes ● No
   Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ● Roads adequate
   Remarks: _____

B. Other Site Conditions

Remarks _____

C. Monitoring Well Condition

1. **Monitoring Wells**
   ○ Properly secured/locked ○ Functioning ○ Routinely sampled
   ○ Good condition ○ All site wells located ○ Needs Maintenance
   ● N/A

Remarks _____

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

To protect the public health and the environment, ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-4 – Former Skeet Range (SS019)

Date of inspection: January 6, 2016

Weather/Temperature: Rain/Overcast 50°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ● Landfill cover/containment
- ○ Access controls
- ● Land development controls
- ● Facility development controls
- ○ Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ● Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing ● N/A

1. **Fencing** ○ Undamaged ○ Location shown on site map ○ Gates secured ○ No
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks Required protective soil cap signage was posted at residences and an open areas.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Semi-annual Protective Cap Inspection
   Responsible party/agency Arizona State University
   Contact Steven J. Hunter (Name) Associate Director (Title)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached See Semi-annual Protective Cap Inspection Report per the South Desert Village Protective Cap Operation and Maintenance Manual, Paragraph 6.3 and ADEQ/ ASU Agreement, Section 22.

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks _____

2. **Land use changes on site** ○ Yes ● No
   Remarks _____

3. **Land use changes off site** ○ Yes ● No
   Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ○ N/A

1. **Landfill cap damaged** ○ Location shown on site map ● No ● Roads adequate
   Remarks: The protective cap appeared to be in good condition with no evidence of disturbance.

B. Other Site Conditions

Remarks _____

C. Monitoring Well Condition

1. **Monitoring Wells**
   ○ Properly secured/locked ○ Functioning ○ Routinely sampled
   ○ Good condition ○ All site wells located ○ Needs Maintenance
   ● N/A

Remarks _____

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

Removal of affected surface soil, and installation of a protective cap, followed by ICs (a VEMUR), and compliance with an approved Operation and Maintenance manual. Components of the O&M include protective cap monitoring and reporting; protective cap repair and maintenance; protective cap disturbance approval; distribution of protective cap awareness documentation and tenant notification, and protective cap boundary and individual dwelling signage. Human habitation of SS019 is allowed in accordance with the ROD, VEMUR, O&M Manual, the Quit Claim Deed between the U.S. Department of Education and ASU, and the Agreement between ADEQ and ASU. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-4 – Firing Range/Skeet Range, (SS020)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ○ Access controls
- ● Land development controls
- ● Facility development controls
- ○ Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ○ Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing ● N/A

1. **Fencing** ● Undamaged ○ Location shown on site map ● Gates secured ○ No
   Remarks The site is located within a secure area of the airport.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks The site is located within a secure area of the airport.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency Phoenix-Mesa Gateway Airport Authority
   Contact Chad A. Willis (Name) Environmental & Archaeological Coordinator (Title) 480-988-7612 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached See 2015 Institutional Control Annual Status Reports for the Declaration of Environmental Use Restriction (DEUR) Sites located at the Phoenix-Mesa Gateway Airport (SS016, SS020 [Firing Range and Skeet Range], SS021, and ST012)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks_____

2. **Land use changes on site** ○ Yes ● No
   Remarks_____

3. **Land use changes off site** ○ Yes ● No
   Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ● Roads adequate
   Remarks: _____

B. Other Site Conditions

Remarks _____

C. Monitoring Well Condition

1. **Monitoring Wells**
   ○ Properly secured/locked ○ Functioning ○ Routinely sampled
   ○ Good condition ○ All site wells located ○ Needs Maintenance
   ● N/A

Remarks _____

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

The Firing Range structure remains in place, but not in use. The Firing Range area is used for miscellaneous storage of airport-related equipment. The former Skeet Range area is located at the end of the runway, and maintained as part of the runway area (open and clear). To protect the public health and the environment, ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-4 – Facilities 1020/1051, (SS021)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ○ Access controls
- ● Land development controls
- ● Facility development controls
- ○ Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ○ Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing ● N/A

1. **Fencing** ○ Undamaged ○ Location shown on site map ○ Gates secured ● No
   Remarks The area is located within the property of the Phoenix- Mesa Gateway Airport. The area is not located within a secured portion of the Phoenix-Mesa Gateway Airport,

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks A no trespassing sign is located at the entrance access road. The signage is not specific to the site.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency Phoenix-Mesa Gateway Airport Authority
   Contact Chad A. Willis (Name) Environmental & Archaeological Coordinator (Title) 480-988-7612 (Phone no.)

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ● No ○ N/A
   Other problems or suggestions: ○ Report attached See 2015 Institutional Control Annual Status Reports for the Declaration of Environmental Use Restriction (DEUR) Sites located at the Phoenix-Mesa Gateway Airport (SS016, SS020 [Firing Range and Skeet Range], SS021, and ST012)

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
   Remarks_____

2. **Land use changes on site** ○ Yes ● No
   Remarks_____

3. **Land use changes off site** ○ Yes ● No
   Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ● Roads adequate
   Remarks: _____

B. Other Site Conditions

Remarks _____

C. Monitoring Well Condition

1. **Monitoring Wells**
   ○ Properly secured/locked ○ Functioning ○ Routinely sampled
   ○ Good condition ○ All site wells located ○ Needs Maintenance
   ● N/A

Remarks _____

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).

Building 1020 is open and used for storage by the airport. Building 1051 is open and unoccupied. To protect the public health and the environment, ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-4 – Building 1010 (SS024)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ● Access controls
- ● Land development controls
- ● Facility development controls
- ○ Well installation restrictions
- ○ Other_____
- ○ Groundwater discharge controls
- ○ Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable ○ N/A

A. Fencing

1. **Fencing** ○ Undamaged ○ Location shown on site map ● Gates secured ○ No
   Remarks The two access gates were locked at the time of the inspection. A section of barbed wire fence along the northeast corner was damaged.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ○ No
   Remarks Signage was visible on the northern gate. Signage on the east gate was obscured by vegetation overgrowth.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ● Yes ○ No ○ N/A
   Site conditions imply ICs being fully enforced ● Yes ○ No ○ N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) Annual DEUR Reporting
   Responsible party/agency City of Mesa
   Contact _____ _____ _____
   Name Title Phone no.

   Requirements in deed or decision documents appear to have been met ● Yes ○ No ○ N/A
   Violations have been reported ○ Yes ○ No ● N/A
   Other problems or suggestions: ○ Report attached

2. **Adequacy** ● ICs are adequate ○ ICs are inadequate ○ N/A
   Remarks_____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
Remarks A section of eastern exterior wall was damaged exposing building insulation. Unknown if related to building operation or maintenance or vandalism.

2. **Land use changes on site** ○ Yes ● No
Remarks

3. **Land use changes off site** ○ Yes ● No
Remarks

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ● Roads adequate
Remarks:

B. Other Site Conditions

Remarks :

C. Monitoring Well Condition

1. **Monitoring Wells**
○ Properly secured/locked ○ Functioning ○ Routinely sampled
○ Good condition ○ All site wells located ○ Needs Maintenance
● N/A

Remarks

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).
There was no evidence of residential use of Building 1010 at the time of the inspection. To protect the public health and the environment, ICs have been implemented via deed restrictions and a DEUR to prohibit use of the property for residential purposes. LUC/ICs are properly implemented and no violations were noted.

LUC/IC Inspection Checklist

I. SITE INFORMATION

Site name: Former Williams Air Force Base – OU-6 – Old Pesticide/Paint Shop (SS017)/Base Production Well No. 6 (BPW6)

Date of inspection: January 7, 2016

Weather/Temperature: Rain/Overcast 55°F

II. LAND USE CONTROLS (LUCs)

LUCs Include: (Check all that apply)

- ○ Landfill cover/containment
- ○ Access controls
- ○ Land development controls
- ○ Facility development controls
- ○ Well installation restrictions
- ● Other No formalized LUCs/ICs
- ○ Groundwater discharge controls
- ○ Excavation controls
- ○ Groundwater use controls

III. ACCESS AND INSTITUTIONAL CONTROLS ○ Applicable ● N/A

A. Fencing

1. **Fencing** ● Undamaged ○ Location shown on site map ● Gates secured ○ No
   Remarks Site is fenced, gates are secured and in good condition.

B. Other Access Restrictions

1. **Signs and other security measures** ○ Location shown on site map ● No
   Remarks Entrance gate has sign indicating access to authorized personnel only.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   Site conditions imply ICs properly implemented ○ Yes ○ No ● N/A
   Site conditions imply ICs being fully enforced ○ Yes ○ No ● N/A

   Type of monitoring (*e.g.*, self-reporting, drive by) _____
   Responsible party/agency _____
   Contact _____ _____ _____
   Name Title Phone no.

   Requirements in deed or decision documents appear to have been met ○ Yes ○ No ● N/A
   Violations have been reported ○ Yes ○ No ● N/A
   Other problems or suggestions: ○ Report attached

2. **Adequacy** ○ ICs are adequate ○ ICs are inadequate ● N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** ○ Location shown on site map ● No vandalism evident
Remarks_____

2. **Land use changes on site** ○ Yes ● No
Remarks_____

3. **Land use changes off site** ○ Yes ● No
Remarks _____

IV. GENERAL SITE CONDITIONS

A. Landfill Cap Condition ● N/A

1. **Landfill cap damaged** ○ Location shown on site map ○ No ○ Roads adequate
Remarks: _____

B. Other Site Conditions

Remarks The site is secured and the groundwater is currently not being used.

C. Monitoring Well Condition

1. **Monitoring Wells**
● Properly secured/locked ● Functioning ● Routinely sampled
● Good condition ● All site wells located ○ Needs Maintenance
○ N/A

Remarks Monitoring wells located on the property are in good condition secured by perimeter fencing and/or locking caps. Monitoring wells are sampled annually.

V. OVERALL OBSERVATIONS

A. Implementation of the LUC/ICs

Describe issues and observations relating to whether LUC/ICs are effective and functioning as designed. Begin with a brief statement of what the LUC/ICs are to accomplish (i.e., to restrict access, restrict groundwater use, restrict land use, etc.).
No formalized ICs have been instituted for OU-6.